

DEC 20 1910

MYCOLOGIA

IN CONTINUATION OF THE JOURNAL OF MYCOLOGY

Founded by W. A. Kellerman, J. B. Ellis, and B. M. Everhart in 1885

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Vol. II—NOVEMBER, 1910—No. 6



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PUBLISHED BIMONTHLY FOR
THE NEW YORK BOTANICAL GARDEN

BY THE NEW ERA PRINTING COMPANY
LANCASTER, PA.

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EDIBLE MUSHROOMS IN FRANCE

MYCOLOGIA

VOL. II

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POISONOUS MUSHROOMS

WILLIAM A. MURRILL

Considerable attention has been given in these pages to edible species of mushrooms, but very little has been said about poisonous species. This is partly due to the small percentage of the latter as compared with the edible and harmless kinds, and partly to the very inadequate knowledge we have of the poisons contained in mushrooms.

The purpose of the present article is to give a general introduction to the subject and to outline the problems to be solved, with the hope that observations and experiments will be made which will contribute to a more accurate and more practical knowledge of the poisonous species native to this country. In the near future, it is our intention to reproduce in this journal several of these species in their natural colors, and to accompany them with descriptions and notes regarding their chemical composition and their physiological effects on the animal system.

Considering its importance, it is remarkable how little is really known about this subject; and the statements and opinions of various authors are so conflicting that one often does not know what to believe regarding the commonest and best known forms. Most of the literature centers about two species, *Amanita muscaria* and *Amanita phalloides*, which, owing to their abundance, wide distribution, conspicuous appearance, and deadly qualities, have been the chief causes of death from mushroom eating the world over. The clinical side of the subject is an old one, but

[*MYCOLOGIA* for September, 1910 (2: 205-254), was issued September 23, 1910]

careful chemical investigation into the causes of the effects observed dates back only about two decades, being dependent upon the development of modern methods in organic chemistry.

As the use of mushrooms in this country for food becomes more general, the practical importance of this subject will be vastly increased, and it may be possible to discover perfect antidotes or methods of treatment which will largely overcome the effects of deadly species. This would be a great boon even at the present time, and there will always be children and ignorant persons to rescue from the results of their mistakes. Another very interesting field, both theoretical and practical in its scope, is the use of these poisons in minute quantities as medicines, as has been done with so many of the substances extracted from poisonous species of flowering plants, and even from rattlesnakes and other animals. Thus far, only one of them, the alkaloid muscarine, has been so used.

The poisons found in flowering plants belong chiefly to two classes of substances, known as alkaloids and glucosides. The former are rather stable and well known bases, such as aconitine from aconite, atropine from belladonna, nicotine from tobacco, and morphine from the poppy plant. Glucosides, on the other hand, are sugar derivatives of complex, unstable, and often unknown composition, such as the active poisons in digitalis, hellebore, wistaria, and several other plants.

The more important poisons of mushrooms also belong to two similar classes, one represented by the alkaloid muscarine, so evident in *Amanita muscaria*, and the other by the deadly principle in *Amanita phalloides*, which is known mainly through its effects. Besides these, there are various minor poisons, usually manifesting themselves to the taste or smell, that cause local irritation and more or less derangement of the system, depending upon the health and peculiarities of the individual.

The history of mushroom poisoning reaches back to Babylonia and ancient Rome, and every year since then has added to the list of victims, many of whom have been persons of importance. In some cases, poisonous species were used in committing murder. The annual number of deaths in the United States due to mistaking poisonous species for edible ones is probably fifty or more, many of which are not reported.

The characters and tests used to distinguish poisonous mushrooms have been most varied and curious, and nearly always mixed with queer traditions and superstitions. If the percentage of deadly forms were not so small, probably not over one per cent., the fatalities from this source would have undoubtedly been much more numerous. The only safe rule to follow is the one used with other plants, namely, to know each species accurately before eating it. Even the rules carefully formulated by mycologists are almost certain to prove unreliable as men grow bolder and attempt to eat species not previously tested, because everything that is known in this field has been discovered by experiment, and predictions or generalizations of any kind are both unscientific and unsafe. It may be possible to forecast accurately the discovery of a new chemical element with given properties, but mushrooms have not yet been reduced to that basis. The sweeping statement that brown-spored and black-spored species are always safe was only recently controverted by the accidental discovery of the poisonous properties of *Inocybe infida*. The genus *Amanita*, while including the principal deadly species, contains also many that are widely used as food, the differences often being so slight as to be overlooked by experienced collectors.

The genus *Amanita* is distinguished from other white-spored genera by the presence of a universal veil which encloses the entire sporophore in its young stage and remains either at the base of the stipe or as warts on the surface of the pileus when the sporophore is mature. Over thirty American species are listed, but hardly half of them are worthy of the rank, and only five of these are known to be poisonous. The other species mentioned in the following discussion belong to various and widely different genera.

Discomycetes

Most of the cup-fungi that are large enough to be called "mushrooms" are edible, only one conspicuous species, *Gyromitra esculenta*, having a questionable reputation, and this only in old or decaying specimens, which have been found to contain helvolic acid, a deadly poison similar to that occurring in *Amanita phalloides*. Although young and fresh specimens of *Gyromitra esculenta* have been frequently eaten without harm, it is wise to refrain from using the plant for food in any form.

Hymenomycetes

This group comprises tremelline forms, such as *Tremella* and *Auricularia*; fleshy, coral-like forms, such as *Clavaria* and *Sparassis*; thin, tough forms with smooth hymenium, such as *Thelephora* and *Stereum*; fleshy or woody forms with spiny hymenium, such as *Hydnus* and *Odontia*; tough or wood-loving forms with porous hymenium, such as *Polyporus* and *Fomes*; fleshy, terrestrial forms with porous hymenium, such as *Boletus* and *Ceriomyces*; and tough or fleshy forms with true gills, such as *Agaricus* and *Amanita*. In all of these divisions except the last two, the species are usually considered either harmless or too tough for food. One woody species of polypore, *Fomes Laricis*, contains a poison and is used in medicine. The poisonous or suspicious species of the Boletaceae and the Agaricaceae will now be taken up in alphabetical order and their poisonous properties discussed.

It must be clearly understood, however, that this list does not contain all the poisonous mushrooms in America. The only safe method of procedure for the mycophagist is to have two lists, one of species to avoid, and another of species that have been thoroughly tested and found safe under all conditions. The accompanying illustrations are made from colored charts published some years ago in France, intended to give popular instruction in distinguishing poisonous and edible mushrooms. Excellent charts of this kind have also been known for many years in Sweden, owing to the work of Elias Fries at Upsala. Regarding these charts, it must be remembered, first, that they soon get out of date, and, second, that the person using them should have a good general knowledge of the characters of mushrooms, otherwise there will be mistakes, which may sometimes prove fatal, especially in distinguishing the species of *Amanita*. In the case of this genus, I would strongly advise everyone to let all of its species severely alone, so far as eating them goes, and thus eliminate many chances of error.

BOLETACEAE**CERIOMYCES FERRUGINATUS (Batsch) Murrill**

Considered slightly poisonous by most mycologists, but MacIlvaine claims that it loses its peppery taste on cooking and becomes perfectly harmless.

CERIOMYCES MINIATO-OLIVACEUS (Frost) Murrill

Poisonous to some and harmless to others. A case of poisoning by this species was reported by Collins in *Rhodora* for 1899.

SUILLELLUS EASTWOODIAE Murrill.

Properties unknown, but belonging to a suspicious genus.

SUILLELLUS FROSTII (Russell) Murrill

Usually viewed with suspicion because of its red hymenium, but its properties are not accurately known.

SUILLELLUS LURIDUS (Schaeff.) Murrill.

Avoided by most persons and said to contain a small amount of muscarine or closely allied alkaloid, as well as choline, but eaten by others for many years without harmful effects, both in this country and in Europe. Owing to the variety of its forms, it is liable to be confusing unless one uses the red tube-mouths as a distinguishing character and avoids the whole genus, which is the wisest thing to do until its species are more thoroughly tested.

SUILLELLUS MORRISII (Peck) Murrill

Properties unknown. Taste mild, but the species, which is very rare, needs to be tested.

SUILLELLUS RUBINELLUS (Peck) Murrill

Properties unknown. Taste mild, but the species needs to be tested.

TYLOPILUS FELLEUS (Bull.) P. Karst.

Usually intensely bitter, both raw and cooked, and therefore inedible, but not generally considered poisonous.

AGARICACEAE**AMANITA COTHURNATA Atkinson**

This species was collected in quantity in Virginia during the past summer for investigation. While drying the fresh sporophores in the sun, hundreds of flies were attracted to their viscid surfaces and were paralyzed in great numbers after sucking the juice, thus indicating a close relationship with *A. muscaria*.

AMANITA MUSCARIA L.

One of the most deadly mushrooms, celebrated for centuries on account of its poisonous properties, due to the alkaloid muscarine, which affects the ganglia controlling the nerves of the heart and thus retards and finally stops its action, if taken in sufficient quantity. Atropine has the opposite effect on the heart, and has therefore been successfully used as an antidote for muscarine. It is said that daturine, the alkaloid from *Datura Stramonium*, is sometimes used for this purpose instead of atropine.



FIG. 1. French chart showing deadly poisonous species.

The literature of this species is more extensive than that of all other poisonous species combined. It lacks the death-cup and must be carefully distinguished taxonomically; it has been generally used as a fly-poison, and also as an exhilarant in certain parts of Russia; it is celebrated in history because of its long and distinguished list of victims; it has been chemically analyzed more often and more successfully than any other species; and an antidote for its principal poison has been discovered. The writings of Palmer, Mendel, MacIlvaine, Carter, Gibson, Atkinson, Clark, Coville, Chestnut, Peck, Herbst, Kobert, Zellner, Esser, Ford, and others contain many interesting details regarding this species.

AMANITA PANTHERINA DC.

Considered poisonous by all authors, causing intoxication similar to that caused by *A. muscaria*, though in milder form, and containing both muscarine and choline. It is said to be the chief poisonous mushroom of Japan, but has rarely been known to be fatal.

AMANITA PHALLOIDES Fries

This most deadly species, for which no antidote is known, occurs in many forms and colors, but is always characterized by the presence of a prominent death-cup at the base of the stipe. The principal poison is not accurately known chemically, neither have its exact effects on the animal system been determined, although it has been much investigated both by physiologists and chemists. For the rather extensive literature of the subject, the reader is referred to the authors cited under *Amanita muscaria*. It is reasonable to expect that at no very distant date an antidote will be discovered for the deadly amanita, as has been the case with rattlesnake poison and the toxin accompanying diphtheria.

AMANITA STROBILIFORMIS Villad.

This species, according to Ford, contains a small quantity of the deadly poison found in *A. phalloides* and should never be eaten, although claimed by some authors to be harmless. Owing to the present confusion regarding the limitation of species closely related to *A. strobiliformis*, it is wise to suspect the whole group until better known.

CHANTEREL ALECTOROLOPHOIDES (Schaeff.) Murrill

This species, usually known as *Cantharellus aurantiacus* Fries, has been recently investigated, along with *C. tubaeformis*, by Sartory, who pronounces both of them harmless.

CLITOCYBE ILLUDENS Schw.

Pronounced poisonous, though not fatal, by all mycologists who have tested it. Dr. Farlow reported a severe case of poisoning from it in *Rhodora* in 1899. It causes nausea and is soon rejected by all but the strongest stomachs.

ENTOLOMA GRANDE Peck

This species is suspected, possibly on account of the two poisonous European species, *E. lividum* and *E. sinuatum*. It is well to avoid all of our species until thoroughly tested.

HEBELOMA FASTIBILE Fries

Considered poisonous by some, possibly owing to its pungent taste and odor. One or two species of the genus have a bad reputation in Europe. *Hebeloma* is very closely related to the genus *Inocybe*.

INOXYBE INFIDA Peck

An account of the poisonous effects of this species was published in *MYCOLOGIA* for September, 1909. It has since been col-



FIG. 2. French chart showing species considered dangerous.

lected in large quantities and is now being investigated by Dr. W. J. Gies and his assistants.

LACTARIA

Many species of this genus were formerly considered poisonous on account of their acrid taste, but, since it has been found that these peppery, resinous substances are usually decomposed on cooking, it will be necessary to make an experimental revision of the genus. *Lactaria rufa* seems to enjoy the worst reputation,

from all accounts, while *L. torminosa*, *L. fuliginosa*, *L. vellerea*, *L. pyrogala*, and *L. theiogala* are either pronounced poisonous or suspicious by most authors. Care should be exercised in collecting members of this genus for the table.

LEPIOTA MORGANI Peck

This species, which occurs rather abundantly from Indiana to Kansas and south to Texas, may be readily distinguished from *Lepiota americana* and other species of the genus by its green spores. It is harmless to some persons but poisonous to others, though never fatal. Old specimens appear to contain more poison than young ones.

MARASMIUS PERONATUS Fries

Considered slightly poisonous to some persons. It occurs in woods and is sufficiently distinct from *M. oreades* to avoid confusing the two. It is probably only a form of *M. urens*.

MARASMIUS URENS Fries

This species, long considered slightly poisonous, grows in pastures and should be carefully distinguished from *M. oreades*.

PANAELUS CAMPANULATUS Fries

A century ago this species was reported poisonous, inducing sleep. MacIlvaine has tried it in small quantities without harmful results.

PANAELUS PAPILIONACEUS Fries

Said to produce hilarity and a mild form of intoxication if eaten in quantity.

PANUS STYPTICUS Fries

Extremely astringent and disagreeable, and considered poisonous by all authors. Some say that it is a violent purgative. On account of its small size and apparently tough consistency, few persons would think of eating it.

RUSSULA

It seems to be pretty well established for the American species of this genus that have been investigated that all having an agree-

able taste and odor are harmless; but the distinctions between species are so slight that it is usually necessary to test each individual specimen before cooking it. *Russula emetica* is poisonous, containing choline, pilzatropine, and probably muscarine; *R. foetens* is also poisonous, but in a lesser degree; while *R. nitida*, *R. fragilis*, and other species belong to the mildly poisonous or suspected class. No experiments will be of great value until the genus is better known botanically.

TRICHOLOMA SULFUREUM Fries

This species has a strong and disagreeable odor and is considered poisonous by some authors.

VOLVARIA

One species is classed among the very poisonous mushrooms by some European authors, and rosy-spored species in general have long been suspected and avoided by many persons.

Gasteromycetes

Remarkably little is definitely known regarding the properties of the phalloids, the only suspected group of the gasteromycetes. It seems that the strong and very disagreeable odor of many of these plants has discouraged experimentation in this line, and certainly no one would use them for food unless by mistake. *Phallus impudicus*, *Dictyophora duplicata*, *Clathrus cancellatus*, and other species have been usually considered poisonous. MacIlvaine has tested the eggs of a few species and found them harmless, while mature specimens are said to be uniformly fatal to swine. Esser suggests that the sporogenous tissue develops the poison, but this would be strange in view of the fact that the very purpose of this tissue with its peculiar odor is to attract flies, which devour it without harmful results. This group, like so many others, only emphasizes the need of much careful investigation before our knowledge of poisonous mushrooms will be anything like complete.

THE SMUTS AND RUSTS OF UTAH

A. O. GARRETT

This catalogue of smuts and rusts represents the results of eight years of the writer's field work, mostly in Salt Lake, Davis, Summit, Wasatch, Utah, Weber and Sevier counties. The catalogue does not include a complete list of all species known to have been collected in Utah; but only those that have been collected by the writer.

As will be seen from the localities given, most of the collections have been made in Salt Lake County. Unless otherwise specified, all of the canyons mentioned are those of the Wasatch mountains in Salt Lake county. These mountains are a few miles east of Salt Lake City, and run north and south. A spur running east and west forms the northern boundary of the city. City Creek Canyon, in this spur, is nearly due north of the city; to the eastward comes Dry Canyon, and nearly due northeast of the city, Red Butte or Reservoir Canyon. Directly east is Emigration Canyon, the pass through which the pioneers came in the early days. To the south of Emigration is Parley's Canyon, and a mile to the south is Mill Creek, then Big Cottonwood, and finally, three miles south on the boundary of the county, fifteen miles southeast of Salt Lake City, is the mouth of Little Cottonwood. For the most part, these canyons have a length of about fifteen miles; and their altitude increases from about 5,000 feet at the mouth to 8,000-11,000 feet at their head. In general, the altitudes of Salt Lake County vary from 4,210 feet, the level of Great Salt Lake, to 11,563 feet, at the summit of Twin Peaks.

Great care has been taken both in the determination of the host and of its parasite, all specimens having been submitted to specialists for their opinion. In this connection, the writer gratefully acknowledges the assistance rendered by Dr. J. C. Arthur, Dr. P. Sydow, Professor E. W. D. Holway, and Dr. G. P. Clinton for the determination or verification of specimens of rusts and of smuts; and to Dr. P. A. Rydberg, Professor A. S. Hitchcock,

Dr. Aven Nelson, Professor Marcus E. Jones and Miss Alice Eastwood for the determination or verification of the host-plants. To Professor Holway the writer's thanks are also due for furnishing many of the citations given; and to Dr. Arthur for his criticism of the manuscript of the rusts.

USTILAGINALES

USTILAGINACEAE

1. CINTRACTIA CARICIS (Pers.) Magn.

Uredo Caricis Pers. *Syn. Fungi* 225. 1801.

In ovaries of *Carex* sp.: 416, July 7, 1904, City Creek Canyon.

2. SCHIZONELLA MELANOGRAMMA (DC.) Schröt.

Beitrag. Biol. Pfl. 2: 362. 1877.

In leaves of *Carex* sp.: 289, Aug. 15, 1903, near Lake Mary, Big Cottonwood Canyon, 9,500 feet. In leaves of *Carex nebrascensis* Dewey (*C. Jamesii* Torr.): 639, May 6, 1905, near Liberty Park, Salt Lake City. In leaves of *Carex* sp.: 1002, June 25, 1907, Red Butte Canyon.

3. SOROSPORIUM SAPONARIAE Rud.

Linnaea 4: 116.

In inflorescence of *Silene Menziesii* Hook.: 956, Aug. 27, 1906, Mt. Majestic, Big Cottonwood Canyon. Determined by Dr. Clinton. This is the first collection of the species in this country.

4. THECAPHORA DEFORMANS Dur. & Mont.

Ann. Sci. Nat. III. 7: 110. 1847.

In ovaries of *Lathyrus utahensis* Jones: 981a, Sept. 13, 1906, Parley's Canyon. In ovaries of *Vicia oregana* Nutt.: 1021, July 20, 1907, City Creek Canyon.

5. THECAPHORA TRAILII Cooke,

Grevillea 11: 155. 1883.

In heads of *Carduus leiocephalus* (D. C. Eaton) Heller: 834, Aug. 14, 1905, Big Cottonwood Canyon.

6. USTILAGO BROMIVORA (Tul.) Fisch. de Waldh.

Bull. Soc. Nat. Mosc. **40**: 252. 1867.

In ovaries of *Bromus hordeaceus* L.: 210, June 10, 1903, Salt Lake City. In ovaries of *Bromus polyanthus* Scribn.: 836a, Aug. 15, 1905, Big Cottonwood Canyon. In ovaries of *Bromus marginatus* Nees: 1161, Aug. 28, 1908, Red Butte Canyon.

7. USTILAGO CRUS-GALLI Tracy & Earle,

Bull. Torrey Club **22**: 175. 1895.

In stems and leaves of *Panicum Crus-galli* L.: 616, Sept. 16, 1904, Salt Lake City.

8. USTILAGO GAYOPHYTI Hark.

Bull. Calif. Acad. **1**: 36. 1884.

In ovaries of *Gayophytum caesium* Nutt.: 857, Aug. 22, 1906, Big Cottonwood Canyon, 8,650 ft. In ovaries of *Gayophytum intermedium* Rydb.: 501, Aug. 27, 1904, Big Cottonwood Canyon.

9. USTILAGO HYPODYES (Schlecht.) Fries,

Syst. Myc. **3**: 518. 1832.

In leaves and inflorescence of *Sitanion californicum* Smith: 2009, June 19, 1909, Salt Lake City. This is the unusual form referred to by Griffiths in Bull. Torrey Club **31**: 87. In inflorescence of *Eriocoma cuspidata* Nutt.: 2059, July 31, 1909, Fish Creek Canyon, western Sevier Co.

10. USTILAGO LEVIS (Kellerm. & Sw.) Magn.

Abh. Bot. Ver. Prov. Brand. **37**: 69. 1896.

In ovaries of *Avena sativa* L.: 243, July 15, 1903, Salt Lake City; 2052, July 29, 1909, Clear Creek Canyon, western Sevier Co.

11. USTILAGO LONGISSIMA (Sow.) Tul.

Sow. Eng. Fungi, pl. 139. 1799.

In leaves of *Glyceria nervata* Trin.: 615, Sept. 15, 1904, Salt Lake City.

12. USTILAGO LORENTZIANA Thüm.

Flora 63: 30. 1880.

In ovaries of *Hordeum jubatum* L.: 392, June 20, 1904, Poplar Grove, Salt Lake City. In ovaries of *Hordeum nodosum* L.: 165, Oct. 12, 1902, Liberty Park, Salt Lake City. In ovaries of *Hordeum pusillum* Nutt.: 485, Aug. 18, 1904, Liberty Park, Salt Lake City. In nodes of inflorescence of *Sitanion californicum* Smith: 2008, June 19, 1909, Salt Lake City.

13. USTILAGO MACROSPORA Desmaz.

Pl. Crypt. 11: 1727. 1850.

In leaves of *Elymus robustus* Scribn. & Smith: 257, Aug. 3, 1903, Salt Lake City, 4,400 feet.

14. USTILAGO STRIAEFORMIS (Westend.) Niessl.

Hedwigia 15: 1. 1876.

In leaves of *Elymus robustus* Scribn. & Smith: 890, June 23, 1906, Parley's Canyon. In leaves of *Elymus glaucus* Buckl.: 959, July 17, 1906, Parley's Canyon.

15. USTILAGO MULFORDIANA Ellis & Ev.

Bull. Torrey Club 22: 362. 1895.

In inflorescence of *Festuca octoflora* Walt.: 666, June 14, 1905, Salt Lake City.

16. USTILAGO ZEAE (Beckm.) Ung.

Einfl. Bodens 211. 1836.

In inflorescence of *Zea mays* L.: 531, Sept. 10, 1904, Salt Lake City.

TILLETIACEAE

17. ENTYLOMA CRASTOPHILUM Sacc.

Michelia 1: 540. 1879.

In leaves of *Catabrosa aquatica* (L.) Beauv.: 611a, Sept. 1, 1904, Red Butte Canyon. P. Sydow calls this *E. Catabrosae* Johans.

18. ENTYLOMA COMPOSITARUM Farl.

Bot. Gaz. 8: 275. 1883.

In leaves of *Erigeron Coulteri* Porter: 953, Aug. 27, 1906, Big Cottonwood Canyon, 8,750 feet.

19. TILLETTIA ASPERIFOLIA Ellis & Ev.

Jour. Myc. 3: 55. 1887.

In ovaries of *Sporobolus asperifolius* (Nees. & Mayen) Thurb.: 486a, Aug. 18, 1904, Liberty Park, Salt Lake City.

20. TILLETTIA TRITICI (Bjerk.) Wint.

Rabenh. Krypt. Fl. 1¹: 110. 1881.

In ovaries of *Triticum vulgare*: 633a, Salt Lake City.

21. UROCYSTIS AGROPYRI (Preuss.) Schröt.

Abh. Schles. Ges. Abth. Nat. Med. 1869-72: 7. 1870.

In leaves of *Agropyron tenerum* Vasey: 934, Aug. 17, 1906, near Lake Mary, Big Cottonwood Canyon.

22. UROCYSTIS ANEMONES (Pers.) Wint.

Rabenh. Krypt. Fl. 1¹: 123. 1881.

In leaves and stems of *Ranunculus Eschscholtzii* Schlecht: 305, Aug. 13, 1903, Lake Martha, Big Cottonwood Canyon, 9,605 feet. In stems and leaves of *Ranunculus digitatus* Hook.: 710, July 3, 1905, head of south fork, Big Cottonwood Canyon. In leaves and stems of *Ranunculus stenolobus* Rydb.: 500, Aug. 27, 1904, Big Cottonwood Canyon, 9,410 feet.

23. UROCYSTIS CARCINODES (Berk. & Curt.) Fisch. de Waldh.

Aperçu Syst. Ust. 38. 1877.

In stems and leaves of *Actaea arguta* Nutt.: 276, Aug. 13, 1903, Big Cottonwood Canyon, 9,000 feet. In stems and leaves of *Atragene occidentalis* Hornem.: 820, Aug. 10, 1905, Big Cottonwood Canyon, 9,000 feet.

24. UROCYSTIS LITHOPHRAGMAE Garrett,

N. Am. Fl. 7: 56. 1906.

In leaves of *Lithophragma bulbifera* Rydb.: 741, July 10, 1905, head of Little Cottonwood Canyon. Known only from the type locality.

25. UROCYSTIS SOROSPOROIDES Körn.

Fisch. de Waldh. Aperçu Syst. Ustilag. 41. 1877.

In stems and leaves of *Aquilegia caerulea* James: 284, Aug. 15, 1903, Big Cottonwood Canyon, 9,000 feet. In stems and leaves of *Aquilegia flavescens* Wats.: 284a, Aug. 15, 1903, Big Cottonwood Canyon. In stems and leaves of *Aquilegia leptocera* Nutt.: 496, Aug. 22, 1904, Big Cottonwood Canyon. In stems and leaves of *Thalictrum sparsiflorum* Turcz.: 793, July 29, 1905, Big Cottonwood Canyon.

26. UROCYSTIS VIOLAE (Sow.) Fisch. de Waldh.

Bull. Soc. Nat. Mosc. 40¹: 258. 1867.

In petioles of *Viola longipes* Nutt.: 767, July 22, 1905, Brighton, Big Cottonwood Canyon, 8,750 feet. In petioles and blades of *Viola Nuttallii* Pursh: 1078, May 16, 1908, City Creek Canyon.

UREDINALES

1. AECIDIUM ABUNDANS Peck,

Bot. Gaz. 3: 34. 1878.

On leaves of *Syphoricarpos rotundifolius* A. Gray: 260, Aug. 7, 1903, summit of ridge of Wasatch Mts., near Salt Lake City, 7,825 feet. The specimens of this collection are peculiar in their unusually long peridia. On leaves of *Syphoricarpos vaccinoides* Rydb.: 716, July 5, 1905, Wasatch Mts., Wasatch Co.; 900a, July 17, 1906, Pharaoh's Glen, Parley's Canyon.

EXSICCATI: Fungi Utah. 19.

2. AECIDIUM EUPHORBIAE Pers.

On leaves of *Euphorbia robusta* (Engelm.) Small, (*E. montana robusta* Engelm.): 722, July 6, 1905, Wasatch mountains, Wasatch Co., at about 9,500 feet altitude. This was found on leaves of

the host together with II and III of *Uromyces Tranzschelii* Syd., and was issued in *Fungi Utah*. 96 as the aecial stage of *U. andina* Magn.

3. AECIDIUM HYDROPHYLLOI Peck,

Ann. Rep. N. Y. State Mus. 26: 78. 1873.

On *Hydrophyllum capitatum* Dougl.: 393, June 22, 1904, Wasatch Mts. near Salt Lake City, 6,500 feet; 877, May 19, 1906, Upper Falls, Provo Canyon, Utah Co. On leaf-blades, petioles and cotyledons of *Hydrophyllum Watsonii* (A. Gray) Rydb.: 648, June 6, 1905, Red Butte Canyon, 5,600 feet.

EXSICCATI: *Fungi Utah*. 35, 36.

4. AECIDIUM MONOICUM Peck,

Bot. Gaz. 4: 230. 1879.

On *Arabis Drummondii* A. Gray: 760, July 22, 1905, Big Cottonwood Canyon, 9,000 feet. This *Aecidium* is probably the aecial stage of 113 on *Trisetum subspicatum* (L.) Beauv. (See *Jour. Myc.* 12: 163, July, 1906.) On *Sophia* sp.: 733, July 8, 1905, Big Cottonwood Canyon. This collection is referred here with some doubt. The peridia are longer and of a darker orange color than those of the *Arabis* host.

EXSICCATI: *Fungi Utah*. 75.

5. AECIDIUM PHACELIAE Peck,

Bull. Torrey Club 11: 49. 1884.

On *Phacelia heterophylla* Pursh: 394, June 22, 1904. Wasatch Mts., near Salt Lake City, 6,500 feet. On Aug. 26, 1909, nearly defunct aecia were found on this host. Around the host-plants *Bromus* was growing, and a rust was found in II and III on the *Bromus*. On *Phacelia alpina* Rydb.: 861, Aug. 24, 1905, Silver Lake, Big Cottonwood Canyon, 8,735 feet.

EXSICCATI: *Fungi Utah*. 31, 77.

6. AECIDIUM ROESTELIOIDES Ellis & Ev.

Jour. Myc. 1: 93. 1885.

On *Sidalcea nervata* A. Nelson: 2092a, near Gogorza, Summit

Co., Aug. 26, 1909. Nearly defunct. Mrs. Clemens collected fine material here in May.

7. AECIDIUM sp.

On *Thalictrum Fendleri* Engelm.: 450, July 12, 1904, Red Butte Canyon, 6,000 feet. On *Thalictrum sparsiflorum* Turcz.: 936, Aug. 25, 1906, Big Cottonwood Canyon, 8,650 feet. The alternate form of this rust is possibly 97, the *Puccinia* on several species of *Agropyron* and *Elymus*. On numerous occasions I have observed the two growing within a few feet of each other. Among other instances might be cited collection 937 of *Puccinia* on *Agropyron caninum* Beauv.

EXSICCATI: Fungi Utah. 76. (Distributed under the name of *Aecidium Thalictri-flavi* Wint.)

8. CAEOMA CONFLUENS (Pers.) Schröt. (*Uredo confluens* Pers.)

Krypt. Fl. Schles. 3¹: 376. 1887.

On *Ribes calycinum* Greene, (*R. saxosum* Coville; *R. oxyacanthoides* L.): 682, June 29, 1905, Big Cottonwood Canyon, 8,500 feet. This is possibly connected with a *Melampsora* found on *Salix phyllicifolia* as recorded under 11 of this list. (See Jour. Myc. 12: 163. July, 1906.)

EXSICCATI: Fungi Utah. 71.

9. GYMNOспорANGIUM NELSONI Arth. I,

Bull. Torrey Club 28: 665. 1901.

On leaves of *Amelanchier alnifolia* Nutt.: 2071, Aug. 2, 1909, Fish Creek Canyon, western Sevier Co.; 2088a, Aug. 26, 1909, Gogorza, Summit Co. On July 7, 1904, in City Creek Canyon, a single leaf of *Amelanchier* bearing spermogonia, probably of this species, was taken.

10. HYALOPSORA POLYPODII (Pers.) Magn. (*Uredo Polypodii* Pers.)

Berichte der deutchen Bot. Gesell. 19: 582. 1901.

On *Filix fragilis* (L.) Underw. (*Cystopteris fragilis* Bernh.): 498, Aug. 27, 1904, Big Cottonwood Canyon, 9,000 feet. Not uncommon.

EXSICCATI: Fungi Utah. 74.

MELAMPSORA BIGELOWII Thüm. II, III,

Mitth. Forstl. Vers. Oest. 2: 37. 1879.

On *Salix exigua* Nutt.: 2000, November 21, 1908, near Salt Lake City. On *Salix lasiandra Fendleriana* Bebb., (*S. lasiandra caudata* Sudw.; *S. Fendleriana* Anders.; *S. pentandra caudata* Nutt.): 318, II, Sept. 3, 1903, Red Butte Canyon, altitude about 5,500 feet; 632, III, April 8, 1905, same locality as 318. (According to Dr. Sydow, this is *M. epitca*.) On *Salix phylicifolia* L., (*S. chlorophylla* Anders.): 846, Aug. 17, 1905, altitude about 8,600 feet. On *Salix luteosericea* Rydb.: 871, Oct. 7, 1905, City Creek Canyon. On *Salix cordata Watsoni* Bebb., (*S. lutea* Nutt.; *S. cordata lutea* Bebb.): 1180, Sept. 12, 1908, City Creek Canyon. On *Salix* sp.: 986, Sept. 29, 1906, Castilla, Utah Co.

12. MELAMPSORA LINI Desmaz. II,

Pl. Crypt. 2049. 1850.

On *Linum Lewisii* Pursh: 408, June 30, 1904, Wasatch Mts. near Salt Lake City. On *Linum Kingii* Wats.: 723, July 6, 1905, Wasatch Mts., Wasatch Co.

EXSICCATI: Fungi Utah. 78.

13. MELAMPSORA MEDUSAE Thüm. II,

Bull. Torrey Club 6: 216. 1906.

On *Populus angustifolia* James: 2115, Oct. 9, 1909, Wasatch Resort, Little Cottonwood Canyon.

14. MELAMPSORA SP. II,

On *Salix schouleriana* Barrett, (*S. Nuttallii* Sarg.; *S. flaves-cens* Nutt.): 903, June 17, 1906, Parley's Canyon, altitude about 7,000 feet. Host determined by Dr. Rydberg. This *Melampsora* seems to be entirely different from the other collections on *Salix*. It greatly resembles the rust on *Populus* in its gross characteristics.

15. MELAMPSORELLA ELATINA (Alb. & Schw.) Arth. (*M. cerastii* Schröt.) II,

N. Am. Fl. 7: 111. 1907.

On *Stellaria borealis* Bibelow, (*Alsine borealis* Britton): 851,

Aug. 21, 1905, Big Cottonwood Canyon, 8,000 feet. Very rare.
EXSICCATI: Fungi Utah. 127.

16. *MELAMPSOROPSIS PYROLAE* (DC.) Arth. (*Chrysomyxa*
Pirolae Rost.) II,

Result. Sci. Congr. Bot. Vienne 338. 1906.

On *Pyrola uliginosa* Torr., (*P. rotundifolia uliginosa* Gray): 683, June 29, 1905, Big Cottonwood Canyon, 8,500 feet. On *Pyrola secunda* L.: 823, Aug. 10, 1905, Silver Lake, Big Cottonwood Canyon, 8,735 feet.

EXSICCATI: Fungi Utah. 72, 73.

17. *PHRAGMIDIUM AFFINE* Syd. I, III,

Ann. Myc. 2: 29. 1904.

On *Potentilla pulcherrima* Lehm.: 315, Sept. 3, 1903, Red Butte Canyon, altitude about 6,500 feet. On *Potentilla viridescens* Rydb.: 491, Aug. 29, 1904, Big Cottonwood Canyon. On *Potentilla glomerata* A. Nelson: 727, July 6, 1905, "Hot Pots," Wasatch Co., 6,912 feet. On *Potentilla Bakeri* Rydb.: 726, July 6, 1905, same locality as 727.

This rust has been collected on other species of *Potentilla* not yet satisfactorily determined.

EXSICCATI: Fungi Utah. 100, 151. Fungi Columb. 1946.

18. *PHRAGMIDIUM ANDERSONI* Shear, II,

Bull. Torrey Club 29: 453. 1902.

On *Dasiophora fruticosa* (L.) Rydb., (*Potentilla fruticosa* L.): 705, July 3, 1905, South Fork Big Cottonwood Canyon. Very rare.

19. *PHRAGMIDIUM HORKELIAE* Garrett, III,

Fungi Utah. 112. Jan. 19, 1907.

On *Horkelia Gordonii* Hook., (*Ivesia Gordonii* T. & G.): 932, Aug. 17, 1906, Mt. Millicent, Big Cottonwood Canyon, 9,500 feet. Very rare, found only in the type locality.

20. *PHRAGMIDIUM JONESII* Dietel, I, III,

Hedwigia 44: 132. 1905.

On *Horkelia Gordonii* Hook., (*Ivesia Gordonii* T. & G.): 703, July 3, 1905, head of Little Cottonwood Canyon. Very rare.

21. PHRAGMIDIUM MONTIVAGUM Arth. II, III,
Torreya 9: 24. 1909.

On *Rosa Fendleri* Crepin: 446, July 12, 1904, Red Butte Canyon. On *Rosa Maximiliani* Nels.: 725, July 6, 1905, Little Snake Creek Canyon, Wasatch Co. On *Rosa grosse-serrata* E. Nelson: 2049, July 28, 1909, Fish Creek Canyon, western Sevier Co. (Host determined by Dr. Rydberg.) On *Rosa Macounii* Greene: 2032, July 17, 1909, Emigration Canyon. (Host 2475, determined by Dr. Rydberg.)

22. PUCCINIA ABERRANS Peck, III,
Bot. Gaz. 4: 217. 1879.

On *Smelowskia americana* Rydb., (*S. calycina* Benth. & Hook.): 773, July 28, 1905, on side of Mt. Millicent, Big Cottonwood Canyon, 9,800 feet. The type of this species was collected in Utah.

EXSICCATI: Fungi Utah. 79.

23. PUCCINIA ABSINTHII DC. II, III,
Encycl. 8: 245. 1808.

On leaves of *Artemisia dracunculoides* Pursh: 476, Aug. 5, 1904, City Creek Canyon, Wasatch Mts. at about 6,000 feet. On leaves and stems of *Artemisia nova* A. Nelson: 2030, July 17, 1909, Emigration Canyon. On leaves and stems of *Artemisia tridentata* Nutt.: 223, June 19, 1903, Wasatch Mts., Salt Lake Co., altitude about 5,800 feet; 266a, Aug. 11, 1903, Big Cottonwood Canyon, 7,000 feet; 721a, July 6, 1905, Wasatch Mts., Wasatch Co.; 2060, Aug. 2, 1909, Fish Creek Canyon, western Sevier Co.

EXSICCATI: Fungi Utah. 79, 80, 81.

24. PUCCINIA AEMULANS Syd. (*P. Gymnolomiae* Dietel & Holw.)
I, II, III,
Ann. Myc. 4: 31. 1906.

On stems and leaves of *Gymnolomia multiflora* Benth. & Hook.: 230, I, II, June 27, 1903, Wasatch Mts., near Salt Lake City; 230a, Sept. 3, 1903, Red Butte Canyon. Quite common.

EXSICCATI: Fungi Utah. 15, 16, 42.

25. PUCCINIA AGROPYRI Ellis & Ev. I, II, III,
Jour. Myc. 7: 131. 1892.

On *Agropyron Smithii* Rydb., (*A. occidentalis* Scribn.): 1166, II, III, Sept. 1, 1908, Beck's Hot Springs, near Salt Lake City. On *Clematis ligusticifolia* Nutt.: 2053, I (= *Accidium Clematis* DC.) July 29, 1909, Clear Creek Canyon, western Sevier Co. Prof. C. P. Smith collected this stage on the same host in Cache Co.

EXSICCATI: *Fungi Utah*. 152.

26. PUCCINIA ARNALIS Peck, II, III,
Bot. Gaz. 6: 227. 1881.

On *Arnica cordifolia* Hook.: 304, II, III. Aug. 17, 1903, north fork Big Cottonwood Canyon, at about 9,000 feet; 711, II only, July 4, 1905, same locality. On *Arnica paniculata* A. Nelson: 513, II, III, Aug. 29, 1905, Big Cottonwood Canyon near Brighton, 8,700 feet altitude. (In *Fungi Utah*. 27, the host of this collection was given as *A. rhizomata*.) On *Arnica subplumosa sylvatica* (Greene) A. Nelson: 933, Aug. 17, 1906, Big Cottonwood Canyon, 9,200 feet. Host 1975, determined by A. Nelson.

The original description says: "Teleutospores intermingled with the stylospores." This is true if the specimens are taken late in the season; but those collected when the rust first appears will have uredosori only, as shown by *Fungi Utah*. 26.

EXSICCATI: *Fungi Utah*. 25, 26, 27; *Fungi Columb.* 1846.

27. PUCCINIA ASTERIS Duby, III,
Bot. Gall. 2: 888. 1830.

On leaves of *Aster adscendens* Lindl.: 225, June 22, 1903, City Creek Canyon. On leaves of *Aster Eatoni* (A. Gray) Howell: 477, Aug. 5, 1904, City Creek Canyon. On leaves of *Aster arenarioides* D. C. Eaton: 847, Aug. 20, 1904, Big Cottonwood Canyon, altitude about 6,600 feet. On leaves of *Machaeranthera canescens* (Pursh) A. Gray, (*Aster canescens* Pursh): 459, July 12, 1904, Red Butte Canyon.

EXSICCATI: *Fungi Utah*. 41, 128, 153.

28. PUCCINIA BALSAMORRHIZAE Peck, II, III,

Bull. Torrey Club 11: 49. 1884.

On *Balsamorrhiza sagittata* (Pursh) Nutt.: 390, II, June 17, 1904, near Salt Lake City, 5,000 feet; 461, III, July 20, 1904, near Salt Lake City, 5,000 feet; 644, II, May 14, 1905, on scale-like prophylla, near Salt Lake City, 4,600 feet. Quite common on this host. On *Balsamorrhiza macrophylla* Nutt.: 456, July 12, 1904, Red Butte Canyon, 5,500 feet.

EXSICCATI: Fungi Utah. 61, 62, 63, 154.

29. PUCCINIA CALOCHORTI Peck, I, III,

Bot. Gaz. 6: 228. 1881.

On *Calochortus Nuttallii* T. & G.: 180, I, May 2, 1903, Salt Lake City, 4,575 feet; 194, III, May 14, 1903, Salt Lake City, 4,575 feet.

The type of this species was collected in Utah by Prof. M. E. Jones.

EXSICCATI: Fungi Utah. 90; Fungi Columb. 1953.

30. PUCCINIA CARDUORUM Jacky, II, III,

Zeitschrift fur Pflanzen Krankheiten 9: 288. 1899.

On *Carduus leiocephalus* (Eat.) Heller: 494, II, Aug. 22, 1904, head of Big Cottonwood Canyon, 9,400 feet.

EXSICCATI: Fungi Utah. 69.

31. PUCCINIA CARICINA DC.? III,

Fl. Fr. 6: 60. 1815.

On *Carex Hoodii* Boott, (*C. muricata confixa* Bailey): 317, Sept. 3, 1903, Red Butte Canyon. There is some doubt as to the determination of this rust. Dr. Arthur thinks that it may possibly be *P. Caricis-Asteris*. The sedge was determined by Dr. Theo. Holm.

32. PUCCINIA CARICIS (Schum.) Schröt. I, II, III, (*P. Urticae* Lagerh.).

Krypt. Fl. Schles. 3: 327. 1889.

On *Urtica gracilis* Ait.: 1008, I, June 29, 1907, Parley's Canyon, altitude about 5,100 feet. On *Carex lanuginosa* Michx.:

1009, III, June 29, 1907, same locality as 1008. Much weathered material, and a few fresh sori; 1055, III, Aug. 28, 1907, same locality as 1008, abundance of fresh material. The *Carex* plants grew by the side of the nettles. This collection is from the same clump of plants as 1009. On *Carex rostrata* Stokes: 1121, II, III, Aug. 11, 1908, Gogorza, Summit Co., 6,329 feet altitude.

EXSICCATI: Fungi Utah. 129, 130, 172.

33. PUCCINIA CARICIS-ASTERIS Arth., I, III,
Jour. Myc. 8: 54. 1902.

On *Aster ciliomarginatus* Rydb.: 746, I, July 11, 1905, Big Cottonwood Canyon, 8,750 feet. Host 1603, determined by Dr. Rydberg. On *Aster Fremontii* A. Gray: 844, I, Aug. 17, 1905, Big Cottonwood Canyon, host 1631, altitude about 8,700 feet. On *Aster apicus* (A. Gray) Rydb.: 938, I, Aug. 25, 1906, Big Cottonwood Canyon, host 2008, determined by Dr. Rydberg. On *Aster* sp. nov.: 939, I, Aug. 25, 1906, Big Cottonwood Canyon, host 2009. On *Carex festiva* Dewey: 827, III, Aug. 12, 1905, Big Cottonwood Canyon, 8,750 feet. The *Carex* plants were growing around in these several collections.

EXSICCATI: Fungi Utah. 65, 66, 131, 155.

34. PUCCINIA CINEREA Arth. I, II, III,
Bull. Torrey Club 34: 583. 1907.

On *Ranunculus Cymbalaria* Pursh, (*Orygraphis Cymbalaria* Prantl.): 984, I, Sept. 29, 1906, Thistle Junction, Utah Co., 5,033 feet. That this is the aecial stage of *P. cinerea* is proved by Dr. Arthur's culture work for 1908. At the time this collection was made, the *Ranunculus* was growing in with *Sporobolus filiformis* (Thurb.) Rydb. The grass was infected with a rust (No. 100 of this list), and it was thought at the time that there might be some connection between these two. Issued in Fungi Utah. as *Accidium Ranunculacearum* DC.? On *Poa Fendleriana* (Steud.) Vasey: 1149, II, III, Aug. 29, 1908, Beck's Hot Springs, near Salt Lake City.

EXSICCATI: Fungi Utah. 126, 156.

35. PUCCINIA CIRSI^{II} Lasch,

Rabenh. Fungi Eur. 89.

On *Carduus acaulescens* (A. Gray) Rydb., (*Cnicus Drummondii acaulescens* A. Gray): 266, Aug. 11, 1903, Big Cottonwood Canyon, 8,000 feet. Host 2042, determined by Dr. Rydberg. On *Carduus* sp.: 721, July 6, 1905, Provo Valley, near Midway, Wasatch Co.

EXSICCATI: Fungi Utah. 132.

36. PUCCINIA CIRSI^{II}-LANCEOLATI Schröt. I, II, III,

Krypt. Fl. Schles. 3: 317. 1889.

On *Carduus lanceolatus* L.: 215, II, June 13, 1903, Salt Lake City, 4,450 feet; 336, III, Dec. 25, 1903, Salt Lake City, 4,450 feet; 340, I, April 24, 1904, Salt Lake City, 4,450 feet. This is the first recorded field collection in America of the aecial stage, although Dr. Kellerman previously obtained it from cultures.

EXSICCATI: Fungi Utah. 88.

37. PUCCINIA CLAYTONIATA (Schw.) Syd. (*P. Mariae-Wilsoni* Clinton), I, III,

Monog. Ured. 1: 561. 1903.

On *Montia sibirica* (L.) Howell, (*Claytonia sibirica* L.): 866, III, Aug. 26, 1905, Big Cottonwood Canyon, 8,650 feet; 911, I, Aug. 3, 1906, Big Cottonwood Canyon, 8,650 feet.

EXSICCATI: Fungi Utah. 67.

38. PUCCINIA COMANDRAE Peck, III,

Bull. Torrey Club 11: 49. 1884.

On leaves and stems of *Comandra pallida* A. DC.: 246. July 22, 1903, City Creek Canyon.

EXSICCATI: Fungi Utah. 17; Fungi Columb. 1957.

39. PUCCINIA CONFERTA Dietel & Holw.

Erythea 1: 250. 1893.

On *Artemisia Hookeriana* Besser.: 2047, July 28, 1909, Fish Creek Canyon, western Sevier Co.

40. PUCCINIA CONFLUENS Syd. III,

Monog. Ured. 1: 81. 1902.

On stems and leaves of *Erigeron macranthus* Nutt.: 252, July 27, 1903, Wasatch Mts., near Salt Lake City, at about 6,700 feet altitude.

EXSICCATI: *Fungi Utah*. 89.

41. PUCCINIA CRANDALLII Pammel & Hume, II, III,

Davenport Acad. Sci. 7: 250. 1899.

On *Festuca confinis* Vasey: 2024, II, July 17, 1909, Emigration Canyon; 2103, III, Oct. 2, 1909, Emigration Canyon. This is doubtless the telial stage of *Aecidium abundans*. The host is found in the same general altitude as that of the *Aecidium*, and this rust follows the one on *Symphoricarpos*.

42. PUCCINIA CREPIDIS-ACUMINATAE Syd. II, III,

Oesterr. Bot. Zeitschr. 51: 17. 1901.

On *Crepis acuminata* Nutt.: 386, II, June 17, 1904, Wasatch Mts. near Salt Lake City, altitude 4,750 feet; 674, III, June 22, 1905, Mill Creek Canyon, Salt Lake Co. On *Crepis glauca* (Nutt.) T. & G.: 1185, III, Sept. 26, 1908, Beck's Hot Springs, near Salt Lake City. On *Crepis occidentalis* Nutt.: 183, II, May 2, 1903, Salt Lake City, 4,500 feet; 380, III, June 15, 1904, Salt Lake City, 4,500 feet. On *Crepis scopulorum* Coville: 661, II, III, June 9, 1905, Wasatch Mts., near Salt Lake City. The rust occurs indiscriminately both on leaves and on stems. (Host given as *C. rostrata* in *Fungi Utah*. 46.) On *Crepis* sp. nov.: 391, June 17, 1904, Wasatch Mts., near Salt Lake City.

EXSICCATI: *Fungi Utah*. 20, 46, 133, 157; *Fungi Columb.* 1959. (Issued as *P. crepidicola* in the latter.)

43. PUCCINIA CRESSAE (DC.) Lagerh. I, III, (*P. cretica* Holw.).

Bot. Soc. Brot. 7: 131. 1889.

On *Cressa Truxillensis* H.B.K.: 660, I, June 9, 1905, Beck's Hot Springs, Salt Lake Co., altitude about 4,250 feet; 870, III, Sept. 23, 1905, same locality. Judging from the marked hyper-

trophy of the aecia-producing stems, the mycelium is probably perennial. The fresh specimens of aecia also have the strong odor characteristic of those produced from perennial mycelia.

EXSICCATI: *Fungi Utah*. 91, 158.

44. *PUCCINIA CURTIPES* Howe, III,

Bull Torrey Club 5: 3. 1874.

On *Heuchera rubescens* Torr.: 837, Aug. 15, 1905, head of Big Cottonwood Canyon, about 9,000 feet altitude; 1062, Sept. 28, 1907, American Fork Canyon, Utah Co. On *Heuchera utahensis* Rydb., (*H. parvifolia* Nutt. in part): 209, June 10, 1903, Wasatch Mts., near Salt Lake City, 6,000 feet. On *Mitella stenopetala* Piper., (*Ozomelis stenopetala* Rydb.): 261, Aug. 7, 1903, Black Mountain, Salt Lake Co., altitude 7,500 feet.

EXSICCATI: *Fungi Utah*. 39, 40, 134.

45. *PUCCINIA DOUGLASII* Ellis & Ev. III,

Proc. Acad. Phila. 1893: 152. 1893.

On *Phlox diffusa* (E. Nels.): 2054, July 31, 1909, Fish Creek Canyon, western Sevier Co. Type collected by M. E. Jones at Detroit, Utah.

46. *PUCCINIA DRABAE* Rudolphi, III,

Linnaea 4: 115. 1829.

On leaves, stems and calyx-lobes of *Draba pectinata* (S. Wats.): 920, Aug. 11, 1906, Mt. Minnie, Little Cottonwood Canyon, Salt Lake Co., 10,900 feet. Very rare.

EXSICCATI: *Fungi Utah*. 116.

47. *PUCCINIA EFFUSA* Dietel & Holw. I, III,

Erythea 3: 81. 1895.

On *Viola canadensis* Rydbergii (Greene) House, (*V. Rydbergii* Greene): 817a, Aug. 26, 1905, near Silver Lake, Big Cottonwood Canyon, 8,625 feet. This is figured in North American Uredineae, 105e. According to Mr. Holway, this is *P. Violae* rather than *P. effusa*.

EXSICCATI: *Fungi Utah*. 54.

48. PUCCINIA ELLISII De-Toni, II, III,

Sacc. Syll. 7: 651. 1888.

On *Cynomarathrum Nuttallii* Coulter & Rose, (*Peucedanum graveolens* Wats.): 259, III, Aug. 7, 1903, Wasatch Mts., Salt Lake Co., 7,900 feet. A few spermogonia were found. 719, II, July 5, 1905, Wasatch Mts., Wasatch Co., 9,500 feet.

EXSICCATI: Fungi Utah. 9, 51.

49. PUCCINIA EPILOBII-TETRAGONI (DC.) Wint. I, II, III,

Rabenh. Krypt. Fl. 1¹: 214. 1884.

On *Epilobium paniculatum* Nutt.: 234, II, III, July 2, 1903, City Creek Canyon, altitude about 5,600 feet; 730, II, III, July 6, 1905, Wasatch Co.; 926, I, III, Aug. 13, 1906, Big Cottonwood Canyon, 8,700 feet. Spores of this collection are figured as 113b in North American Uredineae.

EXSICCATI: Fungi Utah. 86, 110.

50. PUCCINIA EXPANSA Link, III,

in Willd. Sp. Pl. 6²: 75. 1825.

On *Senecio dispar* A. Nelson: 738, July 10, 1905, on side of Mt. Millicent, Big Cottonwood Canyon, 10,000 feet.

EXSICCATI: Fungi Utah. 102. (Issued under the name of *P. recedens*.)

51. PUCCINIA FERGUSSONI Berk. & Br. III,

Ann. Nat. Hist. 15: 35. 1875.

On *Viola blanda* L.: 797, Aug. 2, 1905, near Silver Lake, Big Cottonwood Canyon, 8,735 feet.

EXSICCATI: Fungi Utah. 53.

52. PUCCINIA GARRETTII Arth. X, III,

Bull. Torrey Club 32: 41. 1905.

On *Carex nebrascensis* Dewey, (*C. Jamesii* Torr.): 614, X, Oct. 11, 1904, Salt Lake City, 4,250 feet: 633, X, III, April 8, 1905, Red Butte Canyon, 6,000 feet. Dr. Arthur calls attention to the fact that the amphispores of this species have the thinnest walls of any known species. Of a dozen or more collections, all

seem to be on *C. nebrascensis*. Hosts determined by Dr. Holm.

EXSICCATI: Fungi Utah. 44, 45; Fungi Columb. 1759. (Issued in the latter as *P. Caricis*.) The host plant is *C. nebrascensis* in all of these collections.

53. PUCCINIA GAYOPHYTI Billings, I, II, III,

U. S. Geol. Explor. Fortieth Parallel 5: 414. 1871.

On *Gayophytum caesium* Nutt., (*G. racemosum* T. & G.): 275, III, Aug. 13, 1903, Big Cottonwood Canyon; 894, II, III, July 12, 1906, Red Butte Canyon; 2062, Aug. 2, 1909, Fish Creek Canyon, Sevier Co. On *Gayophytum intermedium* Rydb.: 489, III, Aug. 21, 1904, Big Cottonwood Canyon, 7,900 feet. On *Gayophytum pumilum* Wats.? 691, I, III, June 29, 1905, Big Cottonwood Canyon, 8,500 feet. On *Gayophytum ramosissimum* T. & G.: 714, I, III, July 8, 1905, Wasatch Mts., Wasatch Co., 8,500 feet. On *Gayophytum lasiospermum* Greene: 452, July 12, 1904, Red Butte Canyon. Host determined by Dr. Rydberg.

EXSICCATI: Fungi Utah. 49, 50; Fungi Columb. 1851.

54. PUCCINIA GILIAE Ellis & Hark. III,

Bull. Calif. Acad. 1: 34. 1884.

On *Phlox caespitosa* Nutt.: 782, July 29, 1905, Mt. Majestic, Big Cottonwood Canyon, 9,500 feet.

EXSICCATI: Fungi Utah. 28.

55. PUCCINIA GRAMINIS Pers. (*P. poculiformis* Wett.)

II, III,

Tent. Disp. Meth. Fung. in Romer's Neues Mag. 39. 1797

On *Triticum vulgare* L.: 983, Sept. 29, 1906, near Castilla, Utah Co. This collection is unusual in that the telia are mostly on the leaves instead of upon the stems. On *Agropyron tenerum* Vasey: 1175, III, Sept. 4, 1908, near Salt Lake City. On *Beckmannia erucaeformis* (L.) Host: 1174, II, Sept. 4, and 1191, III, Oct. 17, Salt Lake City. On *Elymus condensatus* Presl.: 1193, II, III, Oct. 17, 1908, near Salt Lake City. On *Elymus canadensis* L.: 2001, III, Feb. 22, 1909, near Salt Lake City. On *Sitanion glaber* J. G. Smith: 1176, III, Sept. 4, 1908, near Salt

Lake City. On *Avena sativa* L.: 2012, II, Oct. 2, 1909, Emigration Canyon.

EXSICCATI: Fungi Utah. 160.

56. PUCCINIA GUTIERREZIAE Ellis & Ev. III,

Proc. Acad. Phila. 1893: 152. 1893.

On *Gutierrezia Sarothrae* (Pursh) Berk. & Rav. (*G. Euthamiae* T. & G.): 474, Aug. 5, 1904, City Creek Canyon. Dr. Arthur thinks that this rust may possibly be the same as *P. Grindeliae* Peck. Although *Grindelia squarrosa* is a very abundant weed here, as yet the writer has failed to find any rust associated with it.

The type of this rust was collected by M. E. Jones at Digway, Utah, June, 1892.

EXSICCATI: Fungi Utah. 47.

57. PUCCINIA HARKNESSII Vize,

Grevillea 7: 11. 1878.

On *Stephanomeria minor* Nutt.: 2050, July 29, 1909. Clear Creek Canyon, western Sevier Co.

58. PUCCINIA HELIANTHELLAE (Peck) Arth. II, III,

Bull. Torrey Club 31: 4. 1904.

On *Helianthella uniflora* T. & G.: 712, II, July 5, 1905, Big Cottonwood Canyon, 9,000 feet; 781, III, July 29, 1905, Big Cottonwood Canyon, 8,650 feet.

EXSICCATI: Fungi Utah. 55, 56.

59. PUCCINIA HELIANTHI Schw. II, III,

Syn. Fung. Carol. 73. 1822.

On *Helianthus lenticularis* Dougl., (*H. annuus* A. Gray in part): 982, Sept. 29, 1906, near Castilla, Utah Co., 5,033 feet; 1150, II, Aug. 25, 1908, Beck's Hot Springs, near Salt Lake City, altitude about 4,250 feet.

EXSICCATI: Fungi Utah. 107, 161.

60. PUCCINIA HEMISPERICA (Peck) Ellis & Ev. I, II, III,
N. Am. Fungi 3144.

On leaves and stems of *Lactuca pulchella* DC.: 1007, June 29, 1907, near Salt Lake City, 4,450 feet. The aecia-producing mycelia cause marked hypertrophy of the tissues of the host, and the affected plants grow taller and more slender.

EXSICCATI: Fungi Utah. 22, 136.

61. PUCCINIA HETERANTHA Ellis & Ev. I, II, III,
Erythea 1: 204. 1893.

On *Taraxia subacaulis* (Pursh) Rydb., (*Oenothera heterantha* Nutt.): 688, I, II, June 29, 1905, Big Cottonwood Canyon, 8,600 feet; 912, III, Aug. 3, 1906, Big Cottonwood Canyon, 8,600 feet. Mr. Holway has compared this with the type, and finds that these specimens have more regular spores than those of the type.

EXSICCATI: Fungi Utah. 92, 162.

62. PUCCINIA HEUCHERAЕ (Schw.) Dietel, III,
Ber. Deutsch. Bot. Gesel. 9: 42. 1891.

On *Mitella pentandra* Hook. (*Pectiantia pentandra* Rydb.): 271, Aug. 13, 1903, Big Cottonwood Canyon, 8,700 feet. On *Saxifraga arguta* D. Don. (*Micranthes arguta* Small; *Saxifraga punctata* Auct. Amer.—not L.): 303, Aug. 17, 1903, Big Cottonwood Canyon, 8,900 feet. On *Mitella stenopetala* Piper. (*Ozomelis stenopetala* Rydb.): 521, September 2, 1904, Big Cottonwood Canyon, at about 8,900 feet.

All the above are what are usually separated under the name of *P. saxifrage* Schlecht. Common.

EXSICCATI: Fungi Utah. 58, 108.

63. PUCCINIA HIERACII (Schum.) Mart. III,
Prod. Fl. Mosq. 226. 1817.

On *Hieracium griseum* Rydb.: 519, Aug. 30, 1904, near Lake Solitude, Big Cottonwood Canyon, 9,000 feet. Not common.

EXSICCATI: Fungi Utah. 85.

64. PUCCINIA HOLBOELLII Hornem. III,
Fungi Groenl. 534. 1888.

On leaves of *Arabis retrofracta* Graham, (*A. Holboellii* of Coulter's Manual): 169, April 25, 1903, Salt Lake City, 4,500 feet. Abundant. This rust causes marked hypertrophy of the stem and leaves of its host. Although the writer has made many collections of this rust in various localities, he has never found an aecial stage in any way connected with it.

EXSICCATI: Fungi Utah. 4.

65. PUCCINIA HYDROPHYLLI Peck & Clinton,
Ann. Rep. N. Y. State Mus. 30: 54. 1877.

On *Hydrophyllum capitatum* Dougl.: 181, May 2, 1903, Salt Lake City, 4,500 feet. Abundant. On *Hydrophyllum Watsonii* (A. Gray) Rydb.: 344, May 21, 1904, Red Butte Canyon, Salt Lake Co. Not common on this host.

EXSICCATI: Fungi Utah. 30, 81; Fungi Columb. 1855.

66. PUCCINIA HYSTERICIFORMIS Peck, III,
Bot. Gaz. 6: 276. 1881.

On leaves, stems and rarely on calyx-lobes of *Arenaria uintahensis* A. Nelson: 211, June 10, 1903, Wasatch mountains near Salt Lake City. The type of this species was collected in Utah on *Arenaria verna* Hort.

EXSICCATI: Fungi Utah. 14; Fungi Columb. 1963.

67. PUCCINIA INCLUSA Syd. II, III,
Monogr. Ured. 1: 1902.

On leaves and stems of *Carduus undulatus* Nutt.: 376, June 15, 1904, near Salt Lake City.

EXSICCATI: Fungi Utah. 93.

68. PUCCINIA INTERMIXTA Peck, I, III,
Bot. Gaz. 4: 231. 1879.

On leaves and stems of *Iva axillaris* Pursh: 1087, May 23, 1908, near mouth of Parley's Canyon; 2072, Aug. 6, 1909, Manti, San Pete Co.

The mycelium causes hypertrophy of the tissues of the host, the affected plants seldom flowering. The mycelium is probably perennial.

EXSICCATTI: *Fungi Utah*. 163.

69. *Puccinia Jonesii* Peck, I, III,

Bot. Gaz. 6: 226. 1881.

On *Lomatium platycarpum* (Torr.) Coulter & Rose, (*Peucedanum simplex* Nutt.): 178, I, April 25, 1903, Salt Lake City, 4,500 feet; 195, III, May 15, 1903, same locality as 178. Not very common on this host. On all chlorophyll-bearing parts of *Leptotaenia Eatoni* Coulter & Rose: 185, I, May 2, 1903, Salt Lake City, 4,500 feet; 364, I, III, June 3, 1904, Farmington Canyon, Davis Co.; 395, I, III, June 22, 1904, Wasatch mountains near Salt Lake City; 717, I, III, July 5, 1905, Wasatch Co. Very common on this host. Type collected in Utah by M. E. Jones.

EXSICCATTI: *Fungi Utah*. 5, 6, 7, 8; *Fungi Columb.* 1966, 1967, 2063.

70. *Puccinia Leveillei* Mont. (*P. Geranii-silvatica* Karst.)

Gay, Hist. de Chile 8: 41. 1852.

On leaf-blades and petioles of *Geranium Fremontii* Torr.: 650, June 6, 1905, Red Butte Canyon, altitude about 6,000 feet. This was erroneously given in *Fungi Utah*. as on *G. venosum*, the name being intended for *G. nervosum*. On *Geranium Richardsonii* Fisch. & Traut.: 908, Aug. 1, 1906, near Silver Lake, Big Cottonwood Canyon, 8,750 feet.

EXSICCATTI: *Fungi Utah*. 88, 101.

71. *Puccinia Ligustici* Ellis & Ev. III,

Bull. Torrey Club 22: 363. 1895.

On *Carum Gairdneri* Gray: 190, on seedlings, May 9, 1903, Wasatch mountains near Salt Lake City. On *Carum Garretii* A. Nelson: 658a, June 9, 1905, Wasatch Mts., Salt Lake Co. On *Ligusticum filicinum* S. Wats.; 805, Aug. 4, 1905, Big Cottonwood Canyon near Silver Lake, 8,650 feet.

In Aug. 1904, a single leaf bearing the sorus of some *Puccinia*

was collected in City Creek Canyon. This may have been this *Puccinia* on *Oxyboliis Fendleri* (A. Gray) Heller (*Archemora Fendleri* A. Gray). The specimen having been mislaid, accurate determination either of host or rust is now impossible (479a).

EXSICCATI: Fungi Utah. 57.

72. PUCCINIA LITHOPHRAGMAE Holw. III,

N. Am. Uredineae 1: 51. 1906.

On *Lithophragma parviflora* (Hook.) Nutt., (*Tellima parviflora* Hook.): 189, May 9, 1903, Wasatch mountains near Salt Lake City. Often found on base of petioles beneath the surface of the ground. Figured on Plate 21 of Holway's North American Uredineae.

EXSICCATI: Fungi Utah. 164.

73. PUCCINIA LOBATA Berk. & Curt. III,

Grevillea 3: 54. 1874.

On *Sida hederacea* (Dougl.) Torr.: 1167, Sept. 1, 1908, Beck's Hot Springs near Salt Lake City.

EXSICCATI: Fungi Utah. 164.

74. PUCCINIA MAGNOECIA Ellis & Ev. III,

Bull. Torrey Club 22: 59. 1895.

On *Aster adscendens* Lindl.: 420, July 7, 1904, City Creek Canyon, 5,100 feet altitude.

EXSICCATI: Fungi Utah. 64.

75. PUCCINIA MALVACEARUM Bertero. III,

Mont. in Gay, Hist. Chile 8: 43. 1852.

On leaves, stems and calyx-lobes of *Malva rotundifolia* L.: 198, May 15, 1903, Liberty Park, Salt Lake City; 1065, Sept. 28, 1907, American Fork, Utah Co. On leaves and stems of *Althea rosea* Cav.: 367, June 5, 1904, Salt Lake City; 1090, July 16, 1908, Salt Lake City, on white variety of hollyhock. In the earlier part of the season, these seem to be the most susceptible.

EXSICCATI: Fungi Utah. 105, 165.

76. PUCCINIA MENTHAE Pers. III,

Syn. Fung. 227. 1801.

On *Mentha canadensis* L.: 2121, Oct. 16, 1909, Idlewild, Ogden Canyon, Weber Co.

77. PUCCINIA MERTENSIAE Peck, III,

Bot. Gaz. 6: 227. 1881.

On *Mertensia ciliata* (Torr.) Don.: 763, July 22, 1905, Big Cottonwood Canyon. Host 1510, determined by Dr. Rydberg. On *Mertensia polyphylla* Greene: 762a, July 22, 1905, Big Cottonwood Canyon, altitude about 9,000 feet. Host 1513, determined by Dr. Rydberg. On *Mertensia* sp. nov., related to *M. intermedia*: 765a, July 22, 1905, Big Cottonwood Canyon. The leaves infected by the rust were taken from the plant sent to Dr. Rydberg for determination. (Host 1516.) On *Lappula floribunda* (Lehm.) Greene, (*Echinospermum floribundum* Lehm.): 737, July 10, 1905, near Lake Phoebe, Big Cottonwood Canyon, 9,000 feet. On *Mertensia arizonica* Greene: 695, June 30, 1905, Big Cottonwood Canyon.

Common on the *Mertensia*, but very rare on *Lappula*, notwithstanding the abundance of the latter plant. These species of *Mertensia* have been called *M. Siberica* in much of the material coming from the West.

EXSICCATI: Fungi Utah. 166.

78. PUCCINIA MONARDELLAE Dudley & Thompson,

Jour. Myc. 10: 53. 1904.

On *Monardella odoratissima* Benth.: 2113, Oct. 10, 1909, near Wasatch Resort, Little Cottonwood Canyon.

79. PUCCINIA MONTANENSIS Ellis,

Jour. Myc. 5: 67. 1889.

On *Elymus condensatus* Presl.: 2111, Oct. 2, 1909, Emigration Canyon.

80. PUCCINIA MUTABILIS Ellis & Gall. (*P. Blasdalei* Dietel & Holw.) I, II, III,

Jour. Myc. 5: 67. 1889.

On *Allium acuminatum* Hook. 363, June 3, 1904, Wasatch Mountains near Farmington, Davis Co., at about 5,700 feet altitude. The upper part of the leaf, bearing the aecia, withers before the uredinia and telia are produced on about the middle of the leaf. Not common. This rust is distinguished from the European *P. Alliorum* by its having aecia.

EXSICCATI: Fungi Utah. 83. (Issued as *P. Alliorum*.)

81. PUCCINIA OSMORRHIZAE (Peck) Cooke & Peck, I, II, III,

Ann. Rep. N. Y. State Mus. 29: 73. 1878.

On *Washingtonia divaricata* Britton: 237, III, July 2, 1903, City Creek Canyon, 5,500 feet; 657, I and 658, II, June 9, 1905, same locality as 237, (in Fungi Utah., the host of 237 was given as *W. nuda*). On *Washingtonia obtusa* Coul. & Rose, (*Osmorrhiza nuda* Porter, not Torr.): 2037, I, II, III, Aug. 19, 1909, Big Cottonwood Canyon near Silver Lake. On *Washingtonia occidentalis* (Nutt.) Coul. & Rose: 2042, III, July 21, 1909, Red Butte Canyon.

EXSICCATI: Fungi Utah. 21, 32, 33.

82. PUCCINIA OXYRIAEE Fuckel, III,

Jahrb. Nassauischen Ver Naturk. 29: 14. 1875.

On *Oryria digyna* (L.) Camptd.: 499, Aug. 24, 1904, Big Cottonwood Canyon, 9,410 feet. Very rare.

83. PUCCINIA PALLIDO-MACULATA Ellis & Ev. III,

N. A. Fungi 2234. 1889.

On *Saxifraga arguta* D. Don., (*S. punctata* Auct. Amer.; *Micranthes arguta* Small): 272, Aug. 13, 1903, Big Cottonwood Canyon, 9,505 feet.

EXSICCATI: Fungi Utah. 34.

84. PUCCINIA PARNASSIAE Arth. III,

Bull. Torrey Club 31: 3. 1904.

On leaves and rarely on peduncles of *Parnassia fimbriata* Banks: 288, Aug. 15, 1903, Big Cottonwood Canyon, 9,400 feet. EXSICCATI: Fungi Utah. 24.

85. PUCCINIA PATTERSONIANA Arth.

Bull. Torrey Club 33: 29. 1906.

On *Elymus condensatus* Presl: 1142, Aug. 21, 1908, Parley's Canyon.

86. PUCCINIA PIPERI Ricker? II, III,

Jour. Myc. 11: 114. 1905.

On *Festuca elatior* L.: 892, July 12, 1906, Red Butte Canyon. This was sent to Dr. Arthur for determination, but because of the immature condition of the material, it could not be named with certainty.

87. PUCCINIA PLUMBARIA Peck, I, III,

Bot. Gaz. 6: 228. 1881.

On *Gilia Nuttallii* A. Gray: 268, I, Aug. 13, 1903, Big Cottonwood Canyon near Lake Catherine, 9,600 feet; 510, I, III, Aug. 27, 1904, Big Cottonwood Canyon, 9,525 feet. On *Microsteris micrantha* (Kellogg) Greene, (*Collomia gracilis* Douglas): 187, III, May 2, 1903, Salt Lake City; 2061, Aug. 2, 1909, Fish Creek Canyon, western Sevier Co. So far the writer has failed to find aecia on this host, the telial stage being contemporaneous with the aecia on *Phlox*. Moreover, the telia on *Microsteris* are very confluent often continuously occupying the entire stem, a habit not found on the other hosts. Then too, *Microsteris* is an annual, and the aecial mycelium on *Phlox* is doubtless a perennial, as is evidenced by the hypertrophied leaves of the host and by the strong "slippery-elm" odor of the aecia. The form on *Microsteris* is probably a distinct species which produces telia only. On *Phlox longifolia* Nutt.: 168, I, on leaves of the new growth, April 25, 1903, Salt Lake City; 212, III, June 12, 1903, Salt Lake City.

An abundant species. Type collected by M. E. Jones in Utah.

EXSICCATI: Fungi Utah. 1, 2, 3, 37, 38; Fungi Columb. 1861, 1970.

88. PUCCINIA POARUM Niels, II,
Bot. Tidsskr. 3: 26.

On *Catabrosa aquatica* (L.) Beauv.: 447, July 12, 1904, Red Butte Canyon at about 6,000 feet. On *Poa reflexa* V. & S.: 293, Aug. 16, 1903, Big Cottonwood Canyon, 8,870 feet. On *Poa pratensis* L.: 971, Salt Lake City, 4,300 feet.

EXSICCATI: Fungi Utah. 87, 103, 104.

89. PUCCINIA POROMERA Holw. sp. nov. ined. III,

On *Angelica dilatata* A. Nelson: 255, July 31, 1903, near Upper Falls Provo Canyon, Utah Co.; 449, July 12, 1904, Red Butte Canyon.

This rust is peculiar in that it has the germ-pores of both cells at the septum. Field observations lead the writer to the conclusion that the rust has only the one stage.

90. PUCCINIA PUNCTATA Link, III,

Mag. Naturf. Freunde 8: 30. 1816.

On *Galium triflorum* Michx.: 974, Sept. 13, 1906, Parley's Canyon, at about 6,500 feet.

EXSICCATI: Fungi Utah. 114.

91. PUCCINIA QUADRIPORULA Arth.

Bull. Torrey Club 34: 386. 1907.

On *Carex* sp. (sterile plants): 1056, Aug. 28, 1907, Parley's Canyon.

EXSICCATI: Fungi Utah. 167.

92. PUCCINIA RANUNCULI Blytt, III, (*P. Nuttallii* Ellis & Ev.),

Christiania Vidensk. Forh. (-12). 1882.

On *Ranunculus Eschscholtzii* Schlecht. (*R. nivalis Eschscholtzii* Wats.): 273, Aug. 13, 1903, near Lake Mary, Big Cottonwood Canyon, 9,505 feet. On *Ranunculus stenolobus* Rydb.: 918, Aug. 11, 1906, Big Cottonwood Canyon near Lake Catherine,

9,930 feet; 919, Aug. 11, 1906, Little Cottonwood Canyon, 9,000 feet. Rare.

EXSICCATI: Fungi Utah. 109.

93. PUCCINIA RUBIGO-VERA (DC.) Wint. II, III,

Fl. Fr. 6: 83. Rabenh. Krypt. Fl. 1¹: 217. 1884.

On *Bromus Porteri* (Coul.) Nash: 1137, II, Aug. 21, 1908, Parley's Canyon. On *Bromus sterilis* L.: 1145, II, Aug. 21, 1908, Parley's Canyon. On *Elymus canadensis* L.: 1144, II, Aug. 21, 1908, near Salt Lake City. On *Elymus glaucus* Buckl.: 1010, II, III, June 29, 1907, Parley's Canyon. On *Hordeum jubatum* L.: 2038, II, July 21, 1909, Red Butte Canyon. On *Hordeum nodosum* L.: 1195, II, Nov. 14, 1908, Salt Lake City. On *Hordeum pusillum* Nutt.: 166, II, Oct. 9, 1902, Liberty Park, Salt Lake City.

EXSICCATI: Fungi Utah. 138, 139.

94. PUCCINIA RHODIOLAE Berk. & Br.

Ann. Mag. Nat. Hist. II. 5: 462. 1850.

On *Sedum debile* Watson: 1110, Aug. 6, 1908, Bingham Canyon, Oquirrh Mts., Salt Lake Co. Very rare, having been taken but once in Utah.

95. PUCCINIA SCANDICA Johans, III,

Bot. Notiser 1886: 175.

On *Epilobium alpinum* L.: 508, Aug. 27, 1904, Big Cottonwood Canyon, 9,500 feet. On *Epilobium clavatum* Trelease: 853, Aug. 23, 1905, Big Cottonwood Canyon, 10,000 feet. On *Epilobium Hornemannii* Reichenb.: 840a, Aug. 15, 1905, Big Cottonwood Canyon. Host 1616, determined by Dr. Rydberg.

EXSICCATI: Fungi Utah. 84, 140.

96. PUCCINIA SHERARDIANA Körn. (*P. Malvastri* Peck),

Hedwigia 16: 19. 1877.

On leaves of *Sphaeralcea grossulariaefolia*: 1064, Sept. 28, 1907, American Fork, Utah. Co. On leaves of *Sphaeralcea*

Munroana (Dougl.) Spach.: 1116, Aug. 11, 1908, Gogorza, Summit Co., 6,329 feet.

EXSICCATI: Fungi Utah. 167.

97. PUCCINIA SOLIDAGINIS Peck, III,

Bull. Torrey Club 11: 49. 1884.

On leaves and flowering stems of *Petradoria pumila* (Gray) Greene, (*Solidago pumile* Gray): 227, June 27, 1903, Wasatch Mts. near Salt Lake City. On leaves and stems of *Solidago pulcherrima* A. Nelson: 233, July 2, 1903, City Creek Canyon. These specimens differ from the type in their thin walls and the rounded apex. (The host was given as *S. mollis* Bartl. in Fungi Utah. 18.) On *Solidago trinervata* Greene: 441, July 12, 1904, Red Butte Canyon, 5,200 feet. Dr. Arthur successfully sowed germinating spores from this host (collected April 22, 1905, from the same locality as 441) on *S. canadensis*. (See "Cultures of Uredineae in 1905" in Jour. Myc. 12: 22. 1906.)

EXSICCATI: Fungi Utah. 18, 43, 141; Fungi Columb. 1975.

98. PUCCINIA SP. II, III,

On *Agropyron caninum* (L.) Beauv.: 937, II, III, Aug. 25, 1906, Big Cottonwood Canyon, 8,650 feet. On *Agropyron repens* Beauv.: 316, Sept. 3, 1903, Red Butte Canyon. On *Agropyron spicatum* (Pursh) Scribn. & Smith: 1160, Aug. 28, 1908, Red Butte Canyon.

There are two *Aecidia* which have been collected within a few feet of where this *Puccinia* was afterward found. On June 22, 1904, a collection of *Aecidium Hydrophylli* was made. The leaves of nearby *Agropyron* plants were yellow with the aecidial spores. At a later date abundant material was taken from these plants. I have scarcely ever collected an *Aecidium* on *Thalictrum* without finding *Agropyron* plants in the immediate vicinity, bearing weathered or fresh *Puccinia*.

99. PUCCINIA SP. X, III,

On *Carex* sp.: 2016, July 6, near Pharaoh's Glen, Parley's Canyon.

100. PUCCINIA SP.

On *Sporobolus filiformis* (Thurb.) Rydb.: 984a, Sept. 29, 1906, Thistle Junction, Utah Co., 5,033 feet.

101. PUCCINIA STIPAE Arth. II, III,

Bull. Iowa Agr. Coll. 1884. 160.

On *Stipa minor* (Vasey) Scrib.: 2084, Aug. 26, 1909, near Gogorza, Summit Co. These spores are more nearly round than those of the type. Its aecial stage has been found to be on *Aster*.

102. PUCCINIA SP.

On unknown grass (possibly *Holcus lanatus*): 2023, July 17, 1909, Emigration Canyon, Salt Lake Co.

103. PUCCINIA SUBCIRCINATA Ellis & Ev. I, III,

Jour. Myc. 3: 56. 1887.

On *Senecio dispar* A. Nelson, (*S. lugens* Richards in part): 184, III, May 2, 1903, near Salt Lake City, 4,500 feet; 214, I, June 12, 1903, same locality as 184. On leaves and stems of *Senecio crassulus* A. Gray: 917, I, III, Aug. 11, 1906, near Lake Minnie, Little Cottonwood Canyon, 9,000 feet. On leaves and stems of *Senecio triangularis* Hook.: 299, I, III, Aug. 17, Big Cottonwood Canyon, 8,700 feet.

EXSICCATI: Fungi Utah. 29, 106.

104. PUCCINIA SUBDECORA Syd. & Holw. II, III,

Ann. Myc. 1: 17. 1903.

On *Brickellia grandiflora* Nutt.? (*Coleosanthus grandiflorus* Kuntze?): 672, June 22, 1905, Mill Creek Canyon, about 7,000 feet. Sori on stem beneath the surface of the earth. Very rare.

105. PUCCINIA SUBNITENS Dietel,

Erythea 3: 81. 1895.

On *Distichlis stricta* (Thurb.) Rydb.: 1135, Aug. 18, 1908, Poplar Grove, near Salt Lake City.

This rust is remarkable in the number of species of host-plants capable of infection by its aecidial spores. Rev. J. M. Bates has

found its aecia on *Cleome serrulata*, *Chenopodium album*, *Radicula sinuata*, *Sophia incisa*, and *Salsola Tragus*. Dr. Arthur's culture work has confirmed these hosts, and added *Lepidium apetalum*, *L. virginicum* and *Erysimum asperum* to the list, eight species representing three families of plants!

EXSICCATI: *Fungi Utah*. 169.

106. *PUCCINIA SUKSDORFII* Ellis & Ev. III,

Jour. Myc. 7: 130. 1892.

On *Agoseris elata* (Nutt.) Greene: 1001, June 22, 1907, summit of ridge of Wasatch Mts. near Salt Lake City.

EXSICCATI: *Fungi Utah*. 170.

107. *PUCCINIA SUBSTERILIS* Ellis & Ev. II, III, X,

Bull. Torrey Club 22: 58. 1895.

On *Stipa minor* (Vasey) Scribn.: 2095, Aug. 26, 1909, near Gogorza, Summit Co. (Parley's Canyon).

108. *PUCCINIA TARAXACI* Plowright, II, III,

British Ured. & Ustilag. 186. 1889.

On *Taraxacum officinale* Weber, (*T. taraxacum* Karst.): 213, II, June 12, 1903, Salt Lake City, 4,450 feet; 331, III, Oct. 4, 1903, same locality as 213.

109. *PUCCINIA THALICTRI* Chev. III,

Fl. Paris 1: 417. 1826.

On *Thalictrum sparsiflorum* Turcz.: 818, Aug. 10, 1905, near Lake Solitude, Big Cottonwood Canyon. Host 1972, determined by Dr. Rydberg. Mr. Holway considers this species to be the same as *P. Pulsatillae*. Specimens were issued under the latter name in *Fungi Utah*. 113.

110. *PUCCINIA THLASPEOS* Schubert, III,

Fl. Dresden 2: 254. 1823.

On *Thlaspi glaucum* A. Nelson: 681, July 7, 1905, near Silver Lake, Big Cottonwood Canyon, 8,750 feet. On *Thlaspi coloradensis* Rydb.: 734, July 3, 1905, near Lake Phoebe, Big Cottonwood Canyon, 9,475 feet.

EXSICCATI: *Fungi Utah*. 142.

111. PUCCINIA TOSTA Arth. II, III,
Bull. Torrey Club 29: 228. 1902.

On *Sporobolus asperifolius* (Nees & Meyen) Thurb.: 486, II, Aug. 18, 1904, Liberty Park, Salt Lake City; 597, III, Sept. 17, 1904, same locality as 486.

EXSICCATI: Fungi Utah. 59, 60.

112. PUCCINIA TRELEASIANA Pazschke, III,
Rabenh. Fungi Eur. 3831.

On *Caltha leptosepala* DC.: 283, Aug. 14, 1903, near Lake Catherine, Big Cottonwood Canyon, 9,932 feet.

EXSICCATI: Fungi Utah. 23; Fungi Columb. 1868.

113. PUCCINIA TRISETI Erik.

Ann. Sci. Nat. VIII. 9: 277. 1899.

On *Trisetum spicatum* Richter: 847, Aug. 21, 1905, Big Cottonwood Canyon. Probably the telial stage of *Aecidium monoi-cum* Peck (q. v.).

114. PUCCINIA TROXIMONTIS Peck, II, III,
Bot. Gaz. 6: 227. 1881.

On *Ptilocalais major* (A. Gray) Greene: 182, II, III, May 2, 1903, Salt Lake City. On *Agoseris leontodon* Rydb.: 191, II, May 9, 1903, Salt Lake Co. On *Agoseris heterophylla* (Nutt.) Greene: 659, June 9, 1905, Wasatch Mts., Salt Lake Co. On *Ptilocalais graciloba* Greene: 689, June 29, 1905, Big Cottonwood Canyon, 8,300 feet. On *Agoseris Greenei* (A. Gray) Rydb., (*Troximon gracilens* Greenei A. Gray): 814, Aug. 9, 1905, Big Cottonwood Canyon, 9,300 feet. On *Agoseris gracilens* (A. Gray) Greene, (*Troximon gracilens* A. Gray): 931, Aug. 16, 1906, near Lake Solitude, Big Cottonwood Canyon, 9,000 feet.

Type collected in Utah on *Troximon cuspidatum* by M. E. Jones.

EXSICCATI: Fungi Utah. 70, 115, 171.

115. PUCCINIA TUBERCULANS Ellis & Ev. III,
Proc. Acad. Phila. 1893: 153. 1893.

On *Chrysanthemum viscidiflorus* (Hook.) Nutt., (*Bigelovia Douglasii* A. Gray): 226, June 27, 1903, Wasatch Mts. near Salt

Lake City. On *Chrysanthemus pulcherrimus* A. Nelson: 887, June 23, 1906, Parley's Canyon, altitude about 5,100 feet.

The type of this species was collected on leaves of *Aplopappus* by Prof. M. E. Jones in Nevada.

EXSICCATI: Fungi Utah. 143.

116. PUCCINIA UNIVERSALIS Arth.

Jour. Myc. 14: 21. 1908.

On *Carex stenophylla* Wahl.: 2069, Aug. 3, 1909, Fish Creek Canyon, western Sevier Co. Determined by Dr. Arthur.

117. PUCCINIA UTAHENSIS Garrett, III,

In Holway's North American Uredineae 1: 46. 1906.

On *Thlaspi glaucum* A. Nelson: 779, July 29, 1905, Big Cottonwood Canyon. Type collection. Very rare. It has been found in the type locality only.

EXSICCATI: Fungi Utah. 144.

118. PUCCINIA VERATRI Duby, I, II, III,

In Bot. Gall. 2: 890. 1830.

On *Epilobium alpinum* L.: 274, I, Aug. 13, 1903, head of Big Cottonwood Canyon, 9,510 feet. On *Epilobium clavatum* Trelease: 921, I, Aug. 11, 1906, Little Cottonwood Canyon above Alta. On *Epilobium Drummondii latiusculum* Rydb.?: 852, I, Aug. 23, 1905, Big Cottonwood Canyon. On *Epilobium rubricaulis* Rydb.: 686, I, July 8, 1905, Big Cottonwood Canyon. The *Epilobium* plants were growing around plants of *Veratrum*. On *Epilobium straminium* Rydb.: 913, I, Aug. 3, 1906, Big Cottonwood Canyon below Silver Lake. Host 1893, determined by Dr. Rydberg. On stems, leaves and seedling plants of *Veratrum speciosum* Rydb.: 291, on stems and leaves, Aug. 16, 1903, Big Cottonwood Canyon, 8,700 feet. Rather common.

In the Ann. Myc., Dr. Tranzschel has shown that the aecia on *Epilobium* are connected with *P. Veratri*.

EXSICCATI: Fungi Utah. 82, 135, 159. (The last two were issued under the name of *P. Epilobii-tetragoni*.)

119. PUCCINIA VIOLAE (Schum.) DC. I, II, III,
Fl. Fr. 6: 62. 1915.

On *Viola longipes* Nutt.: 478, Aug. 5, 1904, City Creek Canyon,
5,900 feet.

EXSICCATI: Fungi Utah. 48.

120. PUCCINIA WYETHIAE (Peck) Ellis & Ev.

N. Am. Fungi 2987.

On leaves and stems of *Wyethia amplexicaulis* Nutt.: 205, May 29, 1903, Wasatch mountains near Salt Lake City. In these specimens, the spores are somewhat larger than those of the type.

EXSICCATI: Fungi Utah. 11; Fungi Columb. 1870.

121. PUCCINIA XANTHIIFOLIA Ellis & Ev. III,

Jour. Myc. 6: 120. 1890.

On leaves of *Iva xanthiifolia* Nutt.: 2114, Oct. 9, 1909, near Wasatch Resort, Little Cottonwood Canyon.

122. PUCCINIA ZAUSCHNERIAE Syd. I, III,

Monog. Ured. 1: 435. 1903.

On *Zauschneria Garrettii* A. Nelson: 760, I, June 22, 1905, Mill Creek Canyon; 1049, III, Aug. 28, 1907, Parley's Canyon. In this collection, one-celled and three-celled spores are not uncommon.

The plants attacked by the aecia become slender and the leaves become hypertrophied, thereby indicating a perennial mycelium. Mr. Holway considers this species to be a form of *P. Oenotherae* Vize.

EXSICCATI: Fungi Utah. 145, 173.

123. PUCCINIASTRUM PUSTULATUM (Pers.) Dietel, (*P. Epilobii* Otth.). II,

E. & P. Nat. Pfl. 1¹: 47. 1897.

On *Epilobium adenocaulon* Haussk.: 604, Oct. 1, 1904, Red Butte Canyon, 6,000 feet; 877, May 19, 1906, on seedlings, Upper Falls, Provo Canyon, Utah Co.; 2057, July 31, 1909,

Fish Creek Canyon, Sevier Co. On *Epilobium anagallidifolium* Lam.: 807, Aug. 4, 1905, Silver Lake, Big Cottonwood Canyon, 8,750 feet. On *Epilobium Drummondii* Haussk.: 948, Aug. 25, 1906, near Silver Lake, Big Cottonwood Canyon. Host 2016, determined by Dr. Rydberg. On *Epilobium brevistylum* Barbey: 949, Aug. 25, 1906, near Silver Lake, Big Cottonwood Canyon. Host 2017, determined by Dr. Rydberg.

EXSICCATI: Fungi Utah. 95, III.

124. PUCCINIASTRUM MYRTILLI (Schum.) Arth. (*Melampsora Vacciniorum* Schröt.)

Résult. Sci. Congr. Bot. Vienne 337. 1906.

On *Vaccinium caespitosum* Michx.: 526a, Aug. 1904, Big Cottonwood Canyon. Determined by Dr. P. Sydow.

125. PUCCINIASTRUM PYROLAE (Pers.) Dietel, (*Thecopsora Pyrolae* Karst.),

in E. & P. Nat. Pfl. 1¹: 47. 1897.

On *Pyrola asarifolia incarnata* (Fisch.) Fernald, (*P. uliginosa* Torr.; *P. rotundifolia uliginosa* Gray): 608, Oct. 1, 1904, Red Butte Canyon. On *Pyrola secunda* L.: 713, July 5, 1905, Big Cottonwood Canyon.

126. TRIPHRAGMIUM ECHINATUM Lév.

Ann. Sci. Nat. III, 9: 247. 1848.

On *Ligusticum filicinum* Wats.: 509, Aug. 24, 1904, Big Cottonwood Canyon, 9,410 feet. Found but once, and then but a single specimen.

127. UROMYCES ACONITI-LYCOCTONI (DC.) Wint. I, III,

Rabenh. Krypt. Fl. 1¹: 153. 1884.

On *Aconitum columbianum* Nutt.: 314, Sept. 3, 1903, Red Butte Canyon. The aecia were found in many cases hidden just beneath the surface of the ground, so that probably they often escape detection.

EXSICCATI: Fungi Columb. 1892.

128. *UROMYCES ALBUS* Dietel. & Holw. I, III,

Hedwigia 36: 297. 1897.

On *Vicia trifida* Schw.: 201, I, May 23, 1903, near Salt Lake City, 4,475 feet; 201a, III, same date and locality as 201. In this material, one two-celled teliospore was found. On *Vicia americana truncata* (Nutt.) Brewer, (*V. oregana* Nutt.): 434, III, July 7, 1904, City Creek Canyon, at about 6,000 feet.

Aecidium porosum Peck is the aecial stage of this rust.

EXSICCATI: Fungi Utah. 122; Fungi Columb. 1894.

129. *UROMYCES ASTRAGALI* (Opiz.) Schröt. II, III,

Pilze Sch. 1: 308. 1887.

On *Astragalus decumbens* Gray? 1111, Aug. 6, 1908, Bingham Canyon, Oquirrh mountains, Salt Lake Co. On *Astragalus utahensis* T. & G.: 996, June 22, 1907, Wasatch mountains near Salt Lake City. The rust attacks the stem as well as the leaves of the host. On *Astragalus Purshii* Dougl.: 2046, July 28, 1909, Fish Creek Canyon, western Sevier Co. On *Astragalus Wardii* A. Gray: 2045, July 28, 1909, Fish Creek Canyon, western Sevier Co. On *Astragalus diphysus* A. Gray: 2088, Parley's Park, Parley's Canyon, Aug. 26, 1909.

Sydow holds that this rust is not *U. Astragali*, but possibly *Uredo Oxytropidis* Peck.

EXSICCATI: Fungi Utah. 146.

130. *UROMYCES CARYOPHYLLINUS* (Schrank) Wint.

Rabenh. Krypt. Fl. 1: 149. 1884.

On *Dianthus caryophyllus* L., cult. 2127. March 26, 1910, Salt Lake City.

131. *UROMYCES ERIOGONI* Ellis & Hark. I, II, III,

Bull. Calif. Acad. 1: 29. 1884.

On *Eriogonum campanulatum* Nutt.: 900, I, II, III, July 17, 1906, Parley's Canyon, altitude about 5,200 feet. On *Eriogonum heracleoides* Nutt.: 206, I, May 30, 1903, City Creek Canyon; 239, II, July 2, 1903, City Creek Canyon; 321, III, Sept. 3, 1903,

Red Butte Canyon. On *Eriogonum racemosum* Nutt.: 224, I, June 22, 1903, City Creek Canyon; 972, II, Sept. 13, 1906, Parley's Canyon. On *Eriogonum umbellatum majus* Benth.: 2016, II, July 11, 1909, Emigration Canyon.

EXSICCATI: Fungi Utah. 12, 13, 120, 147, 174.

132. UROMYCES EUPHORBIAE Cooke & Peck, I, III,

Rep. N. Y. State Mus. 25: 90. 1872.

On *Euphorbia serpyllifolia* Pers.: 729, I, III, July 6, 1905, Little Snake Creek Canyon, Wasatch mountains, Wasatch Co. On *Euphorbia dentata* Michx.: 1177, I, III, Sept. 4, 1908, Salt Lake City.

EXSICCATI: Fungi Utah. 148, 175.

133. UROMYCES GLYCYRRHIZAE (Rabenh.) Magn. II, III,

Bericht der Deutsch. Bot. Gesell. 8: 383. 1890.

On all chlorophyll-containing parts of *Glycyrrhiza lepidota* Nutt.: 200, II, May 19, 1903, Salt Lake City, 4,450 feet; 724, II, July 6, 1905, "Hot Pots," Wasatch Co., 6,912 feet; 868, III, Aug. 31, 1905, Salt Lake City; 2056, II, July 31, 1909, Fish Creek Canyon, western Sevier Co. Quite common.

EXSICCATI: Fungi Utah. 98, 99.

134. UROMYCES HEDYSARI-OBSCURI (DC.) Wint. I, III,

Rabenh. Krypt. Fl. 1: 152. 1884.

On *Hedysarum utahense* Rydb.: 2099, Oct. 2, 1909, Emigration Canyon; 2122, Oct. 16, 1909, Ogden Canyon, near Idlewild.

135. UROMYCES HETERODERMUS Syd. III,

Ann. Myc. 4: 29. 1906.

On *Erythronium grandiflorum parviflorum* S. Wats. (*E. parviflorum* Goodeding): 698, July 7, 1905, near Brighton, Big Cottonwood Canyon, 8,800 feet. Type collection.

EXSICCATI: Fungi Utah. 118.

136. *UROMYCES JUNCI* (Desm.) Lév. II, III,
Desm. Pl. Crypt. ed. 2, No. 170.

On *Juncus saximontanus* A. Nelson, (*J. xiphoides montanus* Engelm.): 311, Sept. 3, 1903, Red Butte Canyon. On *Juncus longistyli* S. Wats.: 1115, II, III, Aug. 11, 1908, Gogorza, Summit Co., 6,329 feet.

EXSICCATI: Fungi Utah. 149. (Issued as *U. lupinicola* Bubak.)

137. *UROMYCES FABAE* (Pers.) De Bary, I, II, III,
Ann. Sci. Nat. IV. 20: 72. 1863.

On *Lathyrus coreaceus* White: 464, July 20, 1904, Wasatch mountains near Salt Lake City, at about 6,000 feet altitude. On *Lathyrus utahensis* Jones: 466, July 20, 1904, Wasatch mountains near Salt Lake City, at about 6,000 feet altitude; 977, III, Sept. 13, 1906, Parley's Canyon, at about 7,000 feet altitude.

EXSICCATI: Fungi Utah. 123, 124, 125.

138. *UROMYCES OCCIDENTALIS* Dietel,
Hedwigia Beibl. 42: 98. 1903.

On *Lupinus parviflorus* Nutt.: 2063, Aug. 2, 1909, Fish Creek Canyon, western Sevier Co. On *Lupinus pulcherrimus* Rydb.: 968, Sept. 6, 1906, City Creek Canyon, at about 5,600 feet altitude. Rare.

EXSICCATI: Fungi Utah. 119.

139. *UROMYCES POLYGONI* (Pers.) Fuckel, II, III,
Disp. Meth. Fung. p. 30, 1801. (*Puccinia Polygoni* Pers.)

On *Polygonum aviculare* L.: 1184, Sept. 26, 1908, Salt Lake City.

140. *UROMYCES PLUMBARIUS* Peck, I, II, III,
Bot. Gaz. 4: 127. 1879.

On *Oenothera caespitosa* Nutt., (*Pachylophus caespitosus* Raimann): 899, I, II, July 17, 1906, Parley's Canyon; 973, II, III, Sept. 13, 1906, Parley's Canyon, altitude about 5,200 feet. On *Oenothera marginata* Nutt., (*Pachylophus marginatus* Rydb.):

1197, I, II, III, Nov. 21, 1908, near Salt Lake City: 2048, I, II, III, July 28, 1909, Fish Creek Canyon, western Sevier Co.

EXSICCATI: Fungi Utah. 117, 150.

141. UROMYCES TRANZSCHELII Syd. II, III,

Ann. Myc. 8: 20. 1910.

On *Euphorbia robusta* (Engelm.) Small, (*E. montana robusta* Engelm.): 706, II, July 3, 1905, Little Cottonwood Canyon; 722, II, July 6, 1905, Wasatch Mts., Wasatch Co., at about 9,500 feet altitude; 2055, July 31, 1909, Fish Creek Canyon, western Sevier Co.

EXSICCATI: Fungi Utah. 97. (Issued as *U. andina* Magn.)

142. UROMYCES TRIFOLII (Albert & Schw.) Wint. I, III,

Rabenh. Krypt. Fl. 1¹: 159. 1884.

On *Trifolium repens* L.: 479, Aug. 5, 1904, City Creek Canyon, at about 6,000 feet altitude. Not common.

EXSICCATI: Fungi Utah. 121.

143. UROMYCES ZYGADENI Peck, I, III,

Bot. Gaz. 6: 239. 1881.

On *Zygadenus paniculatus* Watson: 179, I, April 25, near Salt Lake City, 4,475 feet; 197, III, May 15, 1903, near Salt Lake City, 4,500 feet. Not common.

144. UROPYXIS SANGUINEA (Peck) Arth. II, III, (*Puccinia mirabilissima* Pk.),

N. Am. Flora 7: 155. 1907.

On *Berberis repens* Lindl.: 188, May 9, 1903, Wasatch Mts. near Salt Lake City. Common; 2151, July 29, 1909, Fish Creek Canyon, western Sevier Co.

EXSICCATI: Fungi Utah. 10.

HIGH SCHOOL,

SALT LAKE CITY, UTAH.

A NEW BOLETUS FROM JAMAICA

WILLIAM A. MURRILL

During the winter of 1907-8, two species of Boletaceae, the only representatives of the family known from the island, were collected in Jamaica. One of these, *Rostkovites granulatus*, was rather common at Cinchona, at an elevation of 5,000 feet, but, being a temperate species, did not occur at lower elevations. The other, described below, was found in the famous Cockpit Country, a limestone region of 2,000 feet elevation, which has yielded many botanical novelties in recent years.

Gyroporus jamaicensis sp. nov.

Pileus fleshy, small, convex, circular in outline, 1.8 cm. in diameter, 5 mm. thick; surface umbrinous, viscid, finely areolate in places, cuticle tough: context white, unchanging, 1 mm. thick behind, taste slightly mucilaginous; hymenium readily separating from the context, nearly plane, slightly distant from the stipe, tubes white throughout, unchanging, 3.5 mm. long, mouths circular, regular, 4-5 to a mm., edges thin, conspicuously denticulate: spores elongate, smooth, hyaline, $10-12 \times 4-5 \mu$: stipe central, white, subglabrous, smooth, cylindric, curved, 3 cm. long, 3.5 mm. thick, slightly tapering at the base.

Type collected in Troy, Jamaica, at an elevation of 670 meters, in grass in a young growth of coppice on the north slope of a small hill, January 12, 1909, *W. A. Murrill & W. Harris 1093*.

NEWS AND NOTES

Dr. W. A. Murrill, assistant director of the Garden and editor of *Mycologia*, recently spent several weeks in Europe examining types of fungi in various European herbaria.

Mr. F. D. Kern, assistant to Dr. J. C. Arthur of the agricultural experiment station, Lafayette, Indiana, has taken up his residence in New York City as fellow in botany in Columbia University. As part of his major work, Mr. Kern will continue his researches on the genus *Gymnosporangium*.

Mr. Guy West Wilson, for several years past professor of biology in Upper Iowa University, Fayette, Iowa, and formerly research scholar in the New York Botanical Garden, has recently accepted the position of assistant in vegetable pathology in the North Carolina Agricultural Experiment Station.

Mr. Wilmer G. Stover, formerly assistant in the department of botany at Miami University, has been appointed instructor in botany in the Ohio State University, to supply the place made vacant by assistant professor Griggs; who is on leave of absence for one year. In addition to other duties, Mr. Stover will have charge of a course in mycology and fungous diseases of plants for the agricultural college students.

Mr. B. O. Dodge, of Columbia University, accompanied by Mrs. Dodge, spent a week in September at White Post, Virginia, in the Shenandoah Valley, collecting fungi. Special attention was given to parasitic fungi occurring on the estate of Mr. Graham F. Brandy.

Mr. Fred J. Seaver, director of the laboratories, spent a part of August and September collecting fungi in the Rocky Moun-

tains about Denver, Colorado. A large collection of fungi was made at elevations ranging from 6,000 to 14,000 feet. During a part of the time he was accompanied by Professor E. Bethel, of the East Denver High School.

Dr. Melchior Treub, for many years director of the famous botanical garden at Buitenzorg, Java, and director of the Department of Agriculture for the Dutch East Indies, died at Saint-Raphaël, Var, France, on October 3. He was born near Leyden in 1851. Dr. Treub was editor of the important *Annales du Jardin Botanique de Buitenzorg*, beginning with its second volume in 1885 and retaining this editorship even since his retirement about a year ago. He was the author of many noteworthy botanical papers, covering a wide range of topics.

A new book entitled *Diseases of Economic Plants*, by F. L. Stevens and J. G. Hall, of the North Carolina Agricultural Experiment Station, has recently appeared. This work is designed to meet the needs of those students who wish to recognize, wherever this can be done with any degree of certainty, and treat diseases of plants without the laborious process of a detailed microscopic study. Those characters are used in diagnosing diseases which are evident to the naked eye or through the aid of the hand lens, and technicalities are avoided so far as possible, thus making the text a usable one to the agricultural students of the lower grades. The work is confined mainly to the bacterial and fungous diseases.

The introductory chapters contain a brief historical sketch of the development of the science of phytopathology; also statistics regarding the damage caused by fungi, symptoms of disease, methods of preventing diseases, formulae of the various fungicides with directions as to the best methods of applying them, and a discussion of the cost and profit resulting from their use.

The body of the work is devoted to a description of the symptoms of the diseases of plants which are of economic importance with directions as to the best methods of controlling them. These diseases are classified according to the natural relationship of the

hosts on which they occur and all of the diseases of a given host are treated under that host regardless of the relationships of the fungi which cause the diseases. The terms used in designating the various diseases are those most commonly used, or, where these are lacking or ambiguous, a name is made by adding the termination "ose" to the generic name of the fungus which causes the disease. The work is thoroughly illustrated, the illustrations being of such a nature as to be of material aid in the diagnosis of the various diseases.

The appendix contains a brief discussion of the differences in the physiology of the chlorophyl-bearing and chlorophylless plants with a few of the most striking morphological characters of the bacteria and fungi. This part of the work is very brief.

One of the points on which the work is to be commended is the fact that the manuscript of the various parts has been submitted to the best specialists in the groups treated for corrections and criticism, thus eliminating many of the errors which might otherwise appear in a work of this kind and ensuring accuracy as to details. The book will doubtless meet the need of a large number of students, especially in our agricultural colleges.

F. J. SEAVER.

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